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of
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MAMMALS AND BIRDS
of
MOUNT RAINIER NATIONAL PARK

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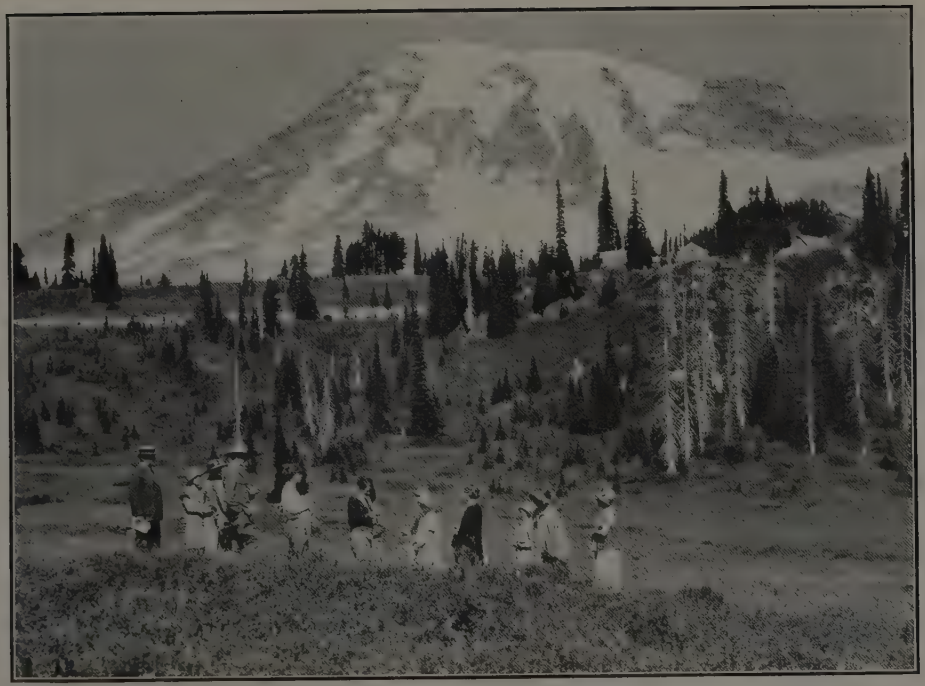

FIG. 1.—All visitors to Mount Rainier National Park can now take trips afield with a Government ranger naturalist, to make the acquaintance of the birds, mammals, and other living things of the trailside

INTRODUCTION

MAMMALS AND BIRDS ON MOUNT RAINIER AS ELEMENTS OF ATTRACTIVENESS

Mammals and birds furnish life and action in what would otherwise be at times a grim and forbidding picture of glacier, beetling cliff, or gloomy forest. They complete the circle of interesting natural objects which combine to justify in so high a degree the establishment of the park. A good animal picture is a thing of beauty; a well-mounted group is still more attractive; but no picture, group, or model can compete in interest with the living animal in its natural surroundings.

Mammal and bird habitats include some of the wildest and grandest areas on Mount Rainier, some accessible with ease, others only with the greatest difficulty. Living creatures are often found in most unexpected places (see pp. 166 and 194), and at least two rodents (white-footed mouse and little chipmunk) and one large carnivore (black bear) have been reported from the extreme summit of Mount Rainier.

It is obvious that the park visitor, if he wishes to do so, can find physical, mental, and spiritual recreation in the pursuit of knowledge of the ways of our furred and feathered friends without in any sense exhausting the possibilities of profitable and pleasant occupation.

It is small wonder that most mountaineers are lovers of wild life. The writings of John Muir, especially, breathe a sympathetic appreciation of the birds and mammals of the mountains. Commenting on an Idaho forest in autumn he writes, "In calm Indian summer, when the heavy winds are hushed, the vast forests covering hill and dale, rising and falling over the rough topography and vanishing in the distance, seem lifeless. No moving thing is seen as we climb the peaks, and only the low, mellow murmur of falling water is heard, which seems to thicken the silence. Nevertheless, how many hearts with warm red blood in them are beating under cover of the woods and how many teeth and eyes are shining. A multitude of animal people, intimately related to us, but of whose lives we know almost nothing, are as busy about their own affairs as we are about ours—beavers are building and mending dams and huts for winter and storing them with food; bears are studying winter quarters as they stand thoughtful in open spaces, while the gentle breeze ruffles the long hair on their backs; elk and deer, assembling on the heights,

are considering cold pastures where they will be farthest away from wolves; squirrels and marmots are busily laying up provisions and lining their nests against coming frost and snow foreseen: and countless thousands of birds are forming parties and gathering their young about them for flight to the southlands * * *." (Our National Parks, Houghton, Mifflin & Co., pp. 16–17.)

ORGANIZATION OF THE WORK ON MOUNT RAINIER

The first studies of the animal life of Mount Rainier conducted by the Biological Survey, and so far as known the earliest serious attempt to obtain definite knowledge of the distribution of the birds and mammals of this region, were made in July and August, 1897, by a party led by Dr. C. Hart Merriam. Doctor Merriam, accompanied by Vernon Bailey and Walter K. Fisher, crossed the Cascade Range with a pack outfit from North Yakima to Mount Rainier. The crossing of the range was made in a very difficult place in the neighborhood of North Cowlitz Pass, whence the descent on the west side led to the upper waters of Cowlitz River, and down this to Skate Creek. Here the ground was honeycombed with mountain-beaver (*Aplodontia*) burrows, so that the horses continually broke through and were greatly exhausted before reaching the trail that led over the Sawtooth Range. This trail was followed up to the summit of the ridge at the south end of Skate Mountain, 4,000 feet above the river. The north slope of Sawtooth Range was then descended to Longmire Springs, whence a southerly slope of Mount Rainier was climbed to Paradise Park, where camp was established and where the party was joined by Dr. A. K. Fisher, who had entered the region via the Nisqually Road and had already made important collections. Active field work was continued in the Paradise Park region from August 2 to 9, when the party descended to the forest cabin of the venerable botanist, Prof. Oscar D. Allen, and from there followed up Rainier Fork and camped in Indian Henrys Hunting Grounds, where they worked until noon of the 13th.

In the course of the work on Mount Rainier 183 specimens of mammals and 25 of birds were secured and forwarded to the Biological Survey collection and are now in the United States National Museum. In addition to these, many specimens were collected while crossing the Cascade Range east of the park, from July 26 to 31. Furthermore, on both east and west slopes of the Cascades, on north and south slopes of the Sawtooth Range, and on southerly and southwesterly slopes of Mount Rainier, numerous points along the boundaries of the life zones were determined with considerable accuracy, and copious notes were made on the distribution and abundance of various species. In addition to having examined the specimens then collected, the author, through the kindness of Doctor Merriam, has

had access to the important notes taken by the party, and these have been incorporated in the present report.

During the summer of 1919 studies of the mammals and birds of the park were conducted under the auspices of the National Park Service (United States Department of the Interior), the Bureau of Biological Survey (United States Department of Agriculture), and the State College of Washington, being provided for in connection with investigations covering the entire State of Washington conducted by the United States Biological Survey and the State College of Washington.

The Biological Survey was represented in the field by Dr. Walter P. Taylor, in charge, and George G. Cantwell, both of whom spent the entire summer season (about three months) in the park. They collected 172 birds and 363 mammals. During July Stanley G. Jewett, of the bureau's division of economic investigations, studied the predatory-animal situation in the southern portion of the park.

The National Park Service was represented by Prof. J. B. Flett, then park ranger, who was detailed to accompany the expedition during the entire summer season of 1919, and William L. Finley of Portland, Oreg., who, with Mrs. Finley and Phoebe and William Finley jr., spent approximately one month in the southern portion of the park, making numerous still-life photographic studies, as well as motion pictures of the mammals and birds.

Prof. William T. Shaw, of the State College of Washington, spent nearly two months in the park during the summer season of 1919, working in cooperation with the government party, and making the circuit of the mountain. Prof. J. W. Hungate, of the State Normal School, Cheney, Wash., worked with the expedition in the southern part of the park during July, while Stanton Warburton, jr., of Tacoma, Wash., was a member of the party from August 17 to September 11.

John W. Anderson and Ben Ulsund, of Nile, Wash., and W. H. Blankenship, of Morton, Wash., acted at different times as guides and packers.

Much credit for information and assistance is due the leading mountain-climbing clubs of the Northwest. Both the Mountaineers of Seattle and the Mazamas of Portland conducted outings on Mount Rainier during the summer of 1919. Both organizations appointed committees on Biological Survey cooperation which rendered assistance in many ways, contributing valuable photographs and important information. In this connection the writers are under special obligation to Prof. Edmond S. Meany, J. Harry Weer, Miss Nancy Emerson Jones, J. Belden Richardson, Miss Mary R. Paschall, Mrs. D. A. Thornburg, Miss Crissie Cameron, and William L. Finley.

Special acknowledgment should be made of the assistance of former Park Ranger J. B. Flett, veteran explorer of Mount Rainier, whose thorough knowledge of the flora, geography, and weather conditions of the park was invaluable to the progress of the work. Professor Flett made freely available for use in the report his library of photographs of the mountain, as well as his abundant information regarding the habits of mountain goats and other park species. The personal interest and cordial assistance of Roger W. Toll, then superintendent of the park, went far to make the expedition successful.

In the preparation of the report the generous cooperation of Dr. T. S. Palmer and Messrs. Edward A. Preble and William H. Cheesman, of the Biological Survey, who have assisted by giving valued suggestions and advice, is gratefully acknowledged.

Descriptions and identifications of mammals are based on monographs in the North American Fauna series of the Biological Survey, the Proceedings of the Biological Society of Washington, the publications of the United States National Museum, and elsewhere. The descriptions of birds are adapted from Bailey's Handbook of Birds of the Western United States (1917). Ridgway's Birds of North and Middle America (Bul. 50, U. S. Nat. Mus., 1901–1919), and Grinnell, Bryant, and Storer's The Game Birds of California (1918) have also been freely consulted. Recourse has been had continually to specimens in the Biological Survey collection, United States National Museum, and to various authoritative works on birds and mammals.

Among the more important of these works are the following:

Bailey, Florence Merriam. Handbook of Birds of the Western United States. Ed. 7; Boston and New York, Houghton Mifflin, 1917.

Bailey, Vernon, and Florence Merriam. Wild Animals of Glacier National Park. National Park Service, 1918. The Mammals, with Notes on Physiography and Life Zones, by Vernon Bailey; The Birds, by Florence Merriam Bailey.

Cooke, Wells W. The Birds of Colorado, Bul. 37, Tech. Ser. 2, Colorado Agric. College, Fort Collins, 1897. Appendix (Bul. 44, Tech. Ser. 4), 1899. Second appendix (Bul. 56, Tech. Ser. 5), 1900.

Coues, Elliott. Fur-Bearing Animals, Misc. Bul. 8, U. S. Geol. Surv. Territories, Washington, 1877.

Dall, William Healey. Spencer Fullerton Baird, a Biography. Philadelphia and London, Lippincott, 1915.

Dawson, William Leon, assisted by John Hooper Bowles. The Birds of Washington, 2 vols., Seattle. The Occidental Publishing Co., 1909.

Elliott, Daniel Giraud. A Synopsis of the Mammals of North America and the Adjacent Seas. Field Columb. Mus., Pub. 45, Zool. Ser., vol. 2, Chicago, 1901.

Grinnell, Joseph; Harold Child Bryant; and Tracy Irwin Storer. The Game Birds of California. Berkeley, University of California Press, 1918.

Hornaday, W. T. The American Natural History, a Foundation of Useful Knowledge of the Higher Animals of North America. London, Newnes, 1904.

Miller, Gerrit S., Jr. Catalogue of the Mammals of Western Europe. Printed by the British Museum, London, 1912.

Nelson, Edward William. Wild Animals of North America. Illustrated. Published by the National Geographic Society, Washington, 1918.

Ridgway, Robert. Birds of North and Middle America. Bul. 50, U. S. Nat. Mus., Parts I to VIII; 1901–1919.

Seton, Ernest Thompson. Life Histories of Northern Animals; An Account of the Mammals of Manitoba, 2 vols. New York, Scribner's, 1909.

Identifications of a number of the more difficult birds, such as song sparrows, fox sparrows, Savannah sparrows, and horned larks, were made by Dr. Harry C. Oberholser. Arthur H. Howell assisted in the determination of the chipmunks and certain other mammals. Identifications in certain groups of birds or mammals which have not been recently revised are provisional only. Long-range field identifications of some forms are in many instances unsatisfactory and are sometimes impossible. It has seemed best, however, to include remarks on identification for whatever utility they may possess.

Records of occurrence of species outside the park have not been used, except those for Bear Prairie, 3 miles south of Longmire, and Mesler's ranch, 1 mile west of the Nisqually Park entrance.

Notes on habits are based chiefly on observations made in the park by members of the field party during the summer of 1919, and in all cases where the year is not indicated the notes pertain to that year. A few additional notes are included, principally relating to the winter occurrence of species of birds in eastern Washington, or concerning other facts of particular interest relating to the species concerned.

Actual authorship of the report is as follows: The introductory items, including matter between pages 1 and 26, were written by Taylor. The accounts of individual birds and mammals, pages 27 to 241, were written by Taylor and Shaw in collaboration.

ITINERARY

The detailed itinerary of the Biological Survey–National Park Service–State College of Washington party of 1919 was as follows: July 3 to 15, Longmire Springs and Indian Henrys Hunting Grounds; July 15 to 24, Stevens Creek and Reflection Lakes; July 24 to August 6, Ohanapecosh Hot Springs; August 7 to 12, Owyhigh Lakes; August 13 to 22, Glacier Basin; August 22 to 26, James Lake; August 26 to 31, Spray Park; August 31 to September 4, Mountain Meadows; September 4 to 10, Sunset Park; September 10 to 17, St. Andrews Park; September 17 to 22, Tahoma Creek; September 22 to 24, Longmire Springs; September 24 to 27, Paradise Valley.

During most of the summer it was necessary to divide camp, both personnel and equipment, because of exigencies of transportation by pack train. Thus it often happened that two camps were occupied

at the same time by different members of the party, though this is not shown in the above itinerary. Furthermore, localities listed comprise main camps only. Two "back-pack" trips were made by Taylor and Flett as follows: White River entrance, White River Park, and Yakima Park, August 14 to 17; and Camp Muir, September 25 and 26. Side trips by pack train were made from Ohanapecosh Hot Springs to Longmire Springs by way of Lewis, Wash., July 24 and 25; and from Spray Park to Fairfax, Wash., and return, by way of Ipsut Pass and Carbon River, August 27 and 28. Through the courtesy of the Mountaineers' Club, Taylor joined its outing party between August 3 and 7, when Indian Bar, Summerland, and Camp Curtis were visited and an attempt made to climb to the main summit of the mountain. While Taylor and Flett were at Tahoma Creek, Cantwell worked at Bear Prairie. Subsequent to the disbanding of the main party Cantwell and Flett did additional work at Longmire Springs the last week in September. Cantwell also spent a part of the first week in October at Mesler's ranch, between the Nisqually Park entrance and Ashford.

Altogether 22 working camps were made and practically every important area in the park visited, the circuit of the mountain being made for the first time, so far as known, by any biological expedition.

PHYSIOGRAPHY [1]

It is universally admitted that the mighty mountain ranges bordering the west coast of North America and including the Cascade Mountains on the north and the Sierra Nevada on the south afford some of the finest and most impressive alpine scenery in the world. Among the many features of special interest, the majestic volcanoes, all slumbering at present, are among the most striking. Of these the most important are Mounts Baker, Rainier, Adams, and St. Helens in Washington; Hood, Jefferson, Three Sisters, and Pitt in Oregon; and Shasta and Lassen in California. "Easily king of all is Mount Rainier," which rears its mighty dome 14,408 feet high and occupies no less than 100 of the 325 square miles of the Mount Rainier National Park.

Mount Rainier is almost wholly composed of basaltic rock built up from the cinders, bombs, and liquid lava of its own eruptions, granite appearing in but few scattered places. An explosion which blew off the top of the mountain is supposed to have reduced its height some 2,000 feet and to have left a capacious crater nearly 3 miles in diameter from north to south. Subsequently two small cinder cones filled this crater and, adding their height, formed a low rounded dome which forms the mountain's summit at present. (Matthes, Mount Rainier and Its Glaciers, 1914, p. 7.)

[1] See Taylor, Ecology, vol. 3, July, 1922, pp. 214–226.

According to Matthes the total area of the glaciers of Rainier is 45 square miles, "* * * an expanse of ice far exceeding that of any other single peak in the United States." These glaciers, more than 25 in number, have had a profound effect on the topography of the mountain, grinding out deep channels on its sides and leaving huge wedges of rock in relief between. These wedges, heading in sharp points near the summit, give place, as one descends, to grassy and flower-covered meadows. Lower down appear deep, glacier-carved canyons and high steep-sided ridges, all heavily forested. Flowing from the ends of the various glaciers are a number of rivers, mostly muddy white in color, which become swollen and turbulent in

FIG. 2.—Mount Adams (at left) and Mount St. Helens (at extreme right) from Kautz Trail, near Mount Ararat. (Photograph by J. B. Fleet, National Park Service)

midday during the summer season from the melting of the ice and snow at their sources.

The climate of Mount Rainier is of a warm humid type, partaking more of that of the coast strip of Washington than of the arid eastern portion of the State. A conspicuous feature is the heavy precipitation, the total measured snowfall at Paradise Inn during 1916–17 (789.5 inches) being apparently greater than for any Weather Bureau station in the United States for any entire season, with the single exception of Tamarack, Calif., in 1906–7. (Fisher, Monthly Weather Review, vol. 46, 1919, p. 328.) This extremely heavy precipitation doubtless has much to do with the occurrence and distribution of mammals and birds on the mountain; but just how much

can not be said at present. The snowfall appears to be heavier in Indian Henrys (on the southwest slope) and lighter in Summerland (on the east slope) than in Paradise Valley on the south slope between (see footnote, p. 11). That the precipitation on the east and northeast slopes of the mountain is less than on the west and southwest slopes is suggested by the difference in the forest. The trees, particularly on the northeast, do not grow so huge and tall as elsewhere; certain floral species (*Picea engelmanni*, *Ceanothus velutinus*, etc.) appear which are absent elsewhere; *Pinus contorta* and *Pinus albicaulis* become more abundant; and extensive areas of obvious aridity, e. g., Yakima Park and Grand Park, are conspicuous.

In winter the rocky slopes above timber line, where in summer such animals as the ptarmigan and mountain goat find food, are deeply covered with snow except where the wind exposes the rocky ridges. An alternate freezing and thawing coats all exposed surfaces with glare ice, which renders food unobtainable and life for birds or mammals impossible.

COMMUNITIES OF MAMMALS, BIRDS, AND PLANTS

LIFE ZONES, HABITATS, AND ASSOCIATIONS

LIFE ZONES

A feature of perpetual interest to all whose observations of mammals, birds, and plants are made with care and insight is their distribution according to temperature, moisture, and other features of their surroundings. "As a fundamental expression of progressive change in the amount of heat and water zonation is the most important feature of vegetation," as one observer said (Clements, Research Methods in Ecology, 1905, p. 281). The old geographies indicated three transcontinental zones in North America—the Frigid Zone, the Temperate Zone, and the Torrid Zone. According to the later and more accurate classification made by Dr. C. Hart Merriam, there are six principal zones, which from north to south in western North America are the Arctic Zone, Hudsonian Zone, Canadian Zone, Transition Zone, Upper Sonoran Zone, and Lower Sonoran Zone. As is well known, the effect of altitude on a mountain is similar to that of latitude on the continent as a whole, so that often all six of these zones may be represented on a single high mountain. As used here a *life zone* is an area inhabited by a more or less definite group of animals and plants limited in its distribution chiefly by temperature. It should be recalled that classification of living forms by zones or habitats in the present state of knowledge is largely for convenience and is often quite arbitrary.

HABITATS AND ASSOCIATIONS

It is well known that temperature is not the only feature of the surroundings which influences distribution. On Mount Rainier moisture is a powerful factor, the effect of which can be shown by the habitat and association. The *habitat*, to adapt and modify somewhat a definition given by Clements (Research Methods in Ecology, 1905, p. 292), is an area characterized by some efficient difference in one or more of the direct factors, humidity, water content, light, by virtue of which the fauna and flora are different from those surrounding them. As used here the term *association* is used for the group of plants and animals of a particular habitat. A habitat may occupy the same area as that of a life zone; more often it occupies only a part of a zone, or transcends zonal boundaries. The principal plant and animal habitats of Mount Rainier can in the main be classified on a moisture basis (see p. 15). A combination of the life zone, mapped on broad lines with temperature as the basic factor, and the habitat with its association, determined chiefly on water relations, should afford a more adequate picture of the distribution of plant and animal life on Mount Rainier than would either alone.

THE LIFE ZONES OF MOUNT RAINIER[1]

Four life zones are represented on the mountain—the Transition, Canadian, Hudsonian, and the Arctic-Alpine. The zones are somewhat obscured as a result of the powerful influence of humidity in western Washington. Mount Rainier, lying 12 miles west of the main divide of the Cascade Mountains, is fully subject to this influence.

THE TRANSITION ZONE

The Transition Zone occupies the smallest area and is the least important of the zones of the park. Although Transition elements occur occasionally to 3,500 or even 4,000 feet (on the west side of the mountain) and were noted on the Carbon, Puyallup, Mowich, Nisqually, and other river systems, the zone can be clearly recognized in the southeastern part of the park only, where it is found in a limited area (4 to 6 square miles) on Stevens Creek and the Muddy Fork of Cowlitz River below an altitude of 3,000 feet. In this region there occurred in the old Indian days repeated fires which laid waste a great area and profoundly modified the plant and animal population. This burning has evidently favored the upward advance of low zone elements.

Among plants here indicating Transition Zone but not necessarily confined to it are the grand or white fir (*Abies grandis*), salal (*Gaul-*

[1] See map in envelope in back of pamphlet.

theria shallon), Oregon grape (*Berberis nervosa*), western bracken (*Pteridium aquilinum pubescens*), red alder (*Alnus oregana*), large-leaf maple (*Acer macrophyllum*), vine maple (*Acer circinatum*), western cottonwood (*Populus trichocarpa*), early willow (*Salix scouleriana*), western dogwood (*Cornus occidentalis*), ocean spray (*Sericotheca discolor*), devil's club (*Echinopanax horridum*), salmon berry (*Rubus spectabilis*), and fetid currant (*Ribes bracteosum*). Birds [2] of Transition include the California quail, Oregon ruffed grouse, spotted owl, Lewis woodpecker, Pacific nighthawk, black-headed grosbeak, California yellow warbler, western warbling vireo, western house wren, Seattle wren, and Oregon chickadee.

FIG. 3.—Stevens Canyon, showing old burn. The canyon bottom below 3,000 feet altitude is Transition Zone. (Photograph by R. W. Toll, National Park Service)

Mammals include the wandering shrew, Bendire water shrew, raccoon, mink, little spotted skunk, Oregon and Olympic meadow mice, and muskrat.

THE CANADIAN ZONE

Comprised in this zone is the heavily timbered area from the park boundaries to 4,500–5,000 feet (except in the southeastern part of the park). This, then, is the area of huge trees of impressive diameter and height and of mossy forest floor, usually clear of thick underbrush. Progress away from trails is laborious, for creeks and springs, uneven topography, and many huge logs make it difficult to maintain a footing. The flora and fauna are limited as to variety, on account of the dominating influence of the forest of western hem-

[2] Permanent or summer resident birds and mammals referred in the following pages to particular zones or habitats are those known or assumed to breed therein. The few migrant birds listed are those most commonly observed in the particular zone or habitat to which they are referred.

lock and Douglas fir, which prevents the growth of all but the most shade-tolerant plants, and so reduces the amount of food for birds and mammals.

The zone occupies an area of varying width all around the mountain. The deep wooded canyons and ridges between, as well, are commonly referable to it, while the amphitheaterlike parks on the headwaters of the principal streams belong to the Hudsonian Zone.

The upper limit of the Canadian Zone in the White River region northeast of the main summit is nearer 5,000 feet than 4,500. The reason for this is not entirely clear. It is known, however, that snow disappears from Summerland before it does from Paradise or Indian Henrys, perhaps because of a smaller total snowfall.[3]

Plants commonly occurring in the Canadian Zone are as follows: Lovely fir (*Abies amabilis*), noble fir (*Abies nobilis*), lodgepole pine (*Pinus contorta*), western white pine (*Pinus monticola*), western yew (*Taxus brevifolia*), bunchberry or dwarf cornel (*Cornus canadensis*), *Menziesia ferruginea*, mountain ash (*Pyrus sitchensis*), *Pachistima myrsinites*, forest anemone (*Anemone deltoidea*), wild bleeding heart (*Capnoides scouleri*), alpine beauty (*Clintonia uniflora*), Mertens coral root (*Corallorhiza mertensiana*), oak fern (*Phegopteris dryopteris*), Mertens saxifrage (*Saxifraga mertensiana*), and false Solomon's seal (*Vagnera sessilifolia*). The birds include the Harris woodpecker, Gairdner woodpecker, northern red-breasted sapsucker, western pileated woodpecker, western flycatcher, Steller jay, Louisiana tanager, chestnut-backed chickadee, western golden-crowned kinglet, russet-backed thrush, and western bluebird. Mammals occurring in this zone are the Trowbridge shrew, brown bat, bobcat, Cooper chipmunk, beaver, and snowshoe rabbit.

The distinction between Canadian and Transition Zones is difficult on Mount Rainier because of the uniformity of the Douglas fir-western hemlock forest, which dominates the flora (excepting upper Canadian) in both. The species of birds and mammals listed above do not ordinarily occur above Canadian, though they are all found also in Transition. There are no birds or mammals characteristic exclusively of the Canadian Zone on the mountain.

THE HUDSONIAN ZONE

At an approximate altitude of 4,500 feet the aspect of the forest changes. The Douglas fir has dropped out somewhat lower down, the lovely fir has become abundant, and now the western hemlock disappears. The trees are reduced in size, and the alpine fir and

[3] It is probable that considerably more snow falls on the west slopes of Mount Rainier than on its east slopes. If this is the case, the zonal boundaries would be higher on the east slopes, for the snow would disappear at an earlier date and the warm growing season would be prolonged.

mountain hemlock, with the lovely fir, dominate the forest. One is now at the lower border of the Hudsonian Zone, which, on the average, embraces the area between 4,500 and 6,500 feet, including the narrow upper portion of the dense woods, as well as the meadow country between the forest and the limit of trees. This area con-

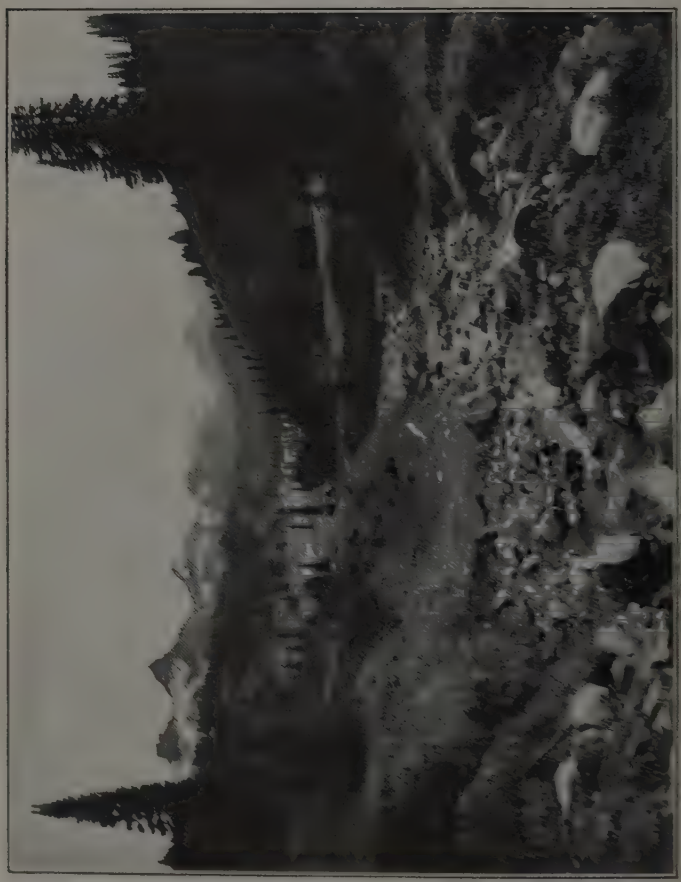

FIG. 4. Hudsonian Zone, Mount Rainier National Park, Paradise River, with Tatoosh Range in the background. The trees are principally subalpine fir (*Abies lasiocarpa*) and mountain hemlocks (*Tsuga mertensiana*). Photograph from National Park Service.

stitutes a belt of varying width, being most extensive in the high country northeast of Mount Rainier, where it includes Grand Park and the Sourdough Mountain district.

This and the next are zones of glorious scenery; and the Hudsonian Zone,[4] with its happy combination of open grassy park and subal-

[4] Above the narrow forested area

pine flower garden on the one hand and pinnacle and glacier on the other, is without doubt the most attractive zone on the mountain. The shade of the deep Canadian forest is gone. Groups of handsome spirelike alpine firs and mountain hemlocks are set about the meadow borders or interspersed over the green expanses, always affording plenty of light and moisture to the grass and flowers. There is an abundance of food for birds and mammals, which are more conspicuous and probably more numerous in this zone than in any other in the park. The Hudsonian is the most desirable and the only favorable zone for camping away from the hotels, because only here (except at Longmire) can forage for horses be found.

Plants occurring principally in this zone are mountain hemlock (*Tsuga mertensiana*), alpine fir (*Abies lasiocarpa*), white-bark pine (*Pinus albicaulis*), Alaska cedar (*Chamaecyparis nootkatensis*), white heather (*Cassiope mertensiana*), red heather (*Phyllodoce empetriformis*), Jeffrey shooting star (*Dodecatheon jeffreyi*), smooth larkspur (*Delphinium glaucum*), avalanche lily (*Erythronium montanum*), yellow deertongue (*Erythronium parviflorum*), delicious huckleberry (*Vaccinium deliciosum*), small red huckleberry (*Vaccinium scoparium*), mountain gentian (*Gentiana calycosa*), lungwort (*Mertensia laevigata*), ovate salal (*Gaultheria ovatifolia*), Nuttall gilia (*Gilia nuttallii*), Sitka valerian (*Valeriana sitchensis*), false hellebore (*Veratrum viride*), squaw grass (*Xerophyllum tenax*), Siberian juniper (*Juniperus sibirica*), Jacob's ladder (*Polemonium humile*), mountain dock (*Polygonum bistortoides*), subalpine lupine (*Lupinus subalpinus*), western anemone or monkey whiskers (*Pulsatilla occidentalis*), Suksdorf buttercup (*Ranunculus suksdorfii*), and Cusick speedwell (*Veronica cusickii*). Among the birds of the zone are the golden eagle, saw-whet owl, Calliope hummingbird, Clark nutcracker, Cassin purple finch, western chipping sparrow, lutescent and Audubon warblers, short-tailed mountain chickadee, Townsend solitaire, Sierra hermit thrush, and mountain bluebird; and the mammals include the red fox, Washington weasel, Canada lynx, mountain lemming mouse, Rainier meadow mouse, large-footed meadow mouse, Rainier pocket gopher, Cascade hoary marmot, little chipmunk, mantled ground squirrel, and cony.

THE ARCTIC-ALPINE ZONE

At or close to the 6,500-foot contour the Arctic-Alpine Zone is entered. The conspicuous snow and ice-covered upper slopes of the mountain, comprising an area of approximately 80 square miles, belong here. With its wilderness of glacier, snow slope, rocky cleaver, beetling cliff, and massive wedge, the scenery of the Arctic-Alpine is nothing short of awe-inspiring. From vantage points

within its borders the surrounding country can be seen for miles, and under favorable conditions Rainier's companion peaks in the Cascade Mountains of Washington and Oregon, and even in British Columbia, can be observed. Here are to be heard the tinkle of tiny streams on or below the surface of the glacier, the cavernous bubbling of water as it pours down through potholes in the ice, the clatter of rocks over the steep glacial slopes, and the occasional roar of ice, snow, or rock avalanches as they thunder over the cliffs.

The zone is the home and headquarters of storms. The furious winds of the upper air, unobstructed, smite the traveler, often eddying about rocky pockets and corners, blowing 40 to 60 miles an hour

FIG. 5.—Winter scene in the Arctic-Alpine Zone. Mount Rainier from Alta Vista, Paradise Park. Timber line marks the lower limit of the Arctic-Alpine Zone. Note that the trees are heavy with glare ice. (Photograph from National Park Service)

in one direction for one moment and perhaps in the opposite direction the next. The heaviest snowfall occurs at moderate elevations, most of the glaciers taking origin in amphitheaters at about 10,000 feet elevation. (Matthes, Mount Rainier and Its Glaciers, 1914, p. 21.)

The Arctic-Alpine Zone is the particular dwelling place of the sandwort (*Arenaria capillaris nardifolia*), two kinds of Indian paint brushes (*Castilleja oreopola* and *C. rupicola*), *Draba aureola*, crowberry (*Empetrum nigrum*), alpine buckwheat (*Eriogonum pyrolaefolium coryphaeum*), *Phacelia sericea*, golden aster (*Erigeron aureus*), *Gilia debilis*, *Hulsea nana*, mountain aster (*Oreostemma alpigena*), pigeon-billed lousewort (*Pedicularis ornithorhyncha*),

Pentstemon menziesii, yellow heather (*Phyllodoce glanduliflora*), Lyall lupine (*Lupinus lyallii*), snowy willow (*Salix nivalis*), Tolmie saxifrage (*Saxifraga tolmiei*), *Smelowskia ovalis*, *Spraguea multiceps*, and *Polemonium viscosum*. Four birds—the pallid horned lark, Hepburn rosy finch, American pipit, and Rainier white-tailed ptarmigan, and one mammal, the mountain goat—also occur in this zone.

THE HABITATS OF MOUNT RAINIER

The habitats of Mount Rainier can be classified according to available moisture.

The following habitats are characterized by extreme moisture: Stream, stream-border, lake, lake-shore, and swamp. Those having moderate moisture are meadow, forest (including the several strata of vegetation due perhaps principally to light, with associated animal life), and burn. Habitats of deficient moisture or of a rocky type include alpine ridge, pumice slope, and rock slide. The glacier habitat probably furnishes little available water, so is tentatively placed here also.

As noted in the paragraph on life zones (p. 8), the classification of living forms by zones or habitats in the present state of knowledge, is largely for convenience and often quite arbitrary. It will be impossible to give a fully satisfactory account of the distribution of the plants and animals of Mount Rainier until a thorough ecological survey is accomplished. On the other hand, the characterization of habitats and associations in connection with the life-zone accounts will give a far better picture of plant and animal distribution than would otherwise be the case.

HABITATS CHARACTERIZED BY EXTREME MOISTURE

LAKE, LAKE-SHORE, STREAM, STREAM-BORDER, SWAMP

Unfortunately, there are few lakes of any size in the park, the largest being Crater or Mowich Lake, northwest of the Mountain. Practically all the lakes are glacial tarns, most of them located at altitudes exceeding 4,000 feet. Ordinarily they lie at so great an altitude in the glacier-hewn amphitheaters that their shores are rocky and devoid of conspicuous vegetation, although scenically they are wonderfully attractive.

The turbulent streams of the mountain are fed by glaciers and, becoming much swollen in midday and afternoon when the sun shines, are a conspicuous feature of the park. Taking origin from the snouts of the glaciers or from springs or swamps on the meadows, the streams radiate from the mountain in all directions and give rise to not a few waterfalls and cascades of extraordinary beauty.

True swamps are of limited extent and fade imperceptibly into stream borders on the one hand and meadows on the other. Restricted areas about Longmire Springs, Reflection Lakes, and in Mountain Meadows may be classified here. There are also swampy tracts at intervals along some of the streams of the park, as Tahoma Creek, Ohanapecosh River, and White River.

Willows of several species (*Salix commutata*, *S. barclayi*, and *S. lasiandra*) grow on the shores of some of the lakes at more moderate altitudes as do also swamp laurel (*Kalmia glauca microphylla*) and the common horsetail (*Equisetum arvense*). Occurring characteristically in the immediate vicinity of streams are the alpine mon-

FIG. 6.—Crater or Mowich Lake, the largest lake in the park. (Photograph from National Park Service)

key flower (*Mimulus alpinus*), Lewis monkey flower (*Mimulus lewisii*), yellow fireweed (*Epilobium luteum*), *Cardamine kamtschatica*, and silky willow (*Salix sitchensis*). Swamp plants include the cattail (*Typha latifolia*), skunk cabbage (*Lysichiton camtschatcense*), swamp star flower (*Trientalis arctica*), *Hypericum anagalloides*, and the Jeffrey shooting star (*Dodecatheon jeffreyi*). Among the birds of these moist habitants are the red-breasted merganser, Pacific harlequin duck, American pintail, northwestern coast heron, semipalmated sandpiper, spotted sandpiper, belted kingfisher, water ouzel, and Lincoln sparrow. Mammals include the navigator and Bendire water shrews, Gibbs shrew mole, raccoon, mink, otter, large-footed meadow mouse, muskrat, and beaver.

HABITATS CHARACTERIZED BY MODERATE MOISTURE

MEADOW

The Hudsonian Zone meadows of Mount Rainier are second only o its glaciers in interest, for, as already noted, they are among the nost famous natural flower gardens in the world. Meadows of imited extent occur in the Canadian and Arctic-Alpine Zones also. The Hudsonian Zone meadows are extensive and include a number of well-known parks just below timber line, as Paradise Park, Grand Park, Spray Park, Sunset Park, and St. Andrews Park.

The principal Hudsonian meadow plants have been listed already (see p. 13). Canadian meadow forms include the rosy spirea

FIG. 7.—Meadows at Owyhigh Lakes in the Hudsonian Zone; Governors Ridge and Barrier Peak in background. (Photograph by J. B. Fleet, National Park Service)

(*Spiraea densiflora*), *Trautvetteria grandis*, lousewort (*Pedicularis bracteosa*), and *Limnorchis leucostachys*. The meadows of the Arctic-Alpine, which grade by imperceptible degrees into the Arctic-Alpine ridges of deficient moisture (see p. 22), exhibit *Smelowskia ovalis*, Lyall lupine (*Lupinus lyallii*), *Saxifraga caespitosa*, snowy willow (*Salix nivalis*), *Arenaria verna*, crowberry (*Empetrum nigrum*), golden aster (*Erigeron aureus*), *Solidago algida*, lousewort (*Pedicularis contorta*), alpine buckwheat (*Eriogonum pyrolaefolium coryphaeum*), and *Agoseris alpestris*. Among meadow birds are the Canada goose, marsh hawk, rufous and Calliope hummingbirds, pallid horned lark, western meadowlark, Brewer blackbird,

western Savannah sparrow, and western robin. Meadow mammals include the coyote, mountain lemming mouse, the Oregon, Rainier, Rocky Mountain, Olympic, and large-footed meadow mice, Rainier pocket gopher, jumping mouse, little chipmunk, and mantled ground squirrel.

FOREST

This habitat is one of the most conspicuous on the mountain. The forest is of a dense and somber character. "The trees, pushing upward for light, are very tall and free from limbs for more than half their height. Their tops form a continuous cover which the

FIG. 8.—Mountain Meadows. One of the few open places in the park below 4,500 feet altitude. (Photograph by Walter P. Taylor, Biological Survey)

sunshine rarely penetrates and on which the light snows of early winter fall and melt without reaching the ground. Even in midsummer the light is soft and shaded and the air cool and humid." (Allen, The Forests of Mount Rainier National Park, 1916, p. 1.) Exclusive of burns, the heavily forested tract embraces the area between the park boundaries and 5,000 feet. The principal plants are, of course, trees, including the Douglas fir (*Pseudotsuga taxifolia*), western hemlock (*Tsuga heterophylla*), lovely fir (*Abies amabilis*), noble fir (*Abies nobilis*), and giant cedar (*Thuja plicata*). The western white pine (*Pinus monticola*) occurs scattered through the forest, and at higher levels there is a considerable quantity of Alaska cedar (*Chamaecyparis nootkatensis*), as well as some mountain or

black hemlock (*Tsuga mertensiana*). On the northeast side of the mountain the Engelmann spruce (*Picea engelmannii*) occurs commonly in this habitat. The lodgepole pine (*Pinus contorta*) is occasionally encountered, occurring principally in the White River region.

In a few places the upper boundary of the forest habitat coincides with that of the Canadian Zone, but normally the deep, shady wood extends into the lower Hudsonian Zone for about 500 feet of altitude.

The forest habitat possesses height as well as breadth, and can be subdivided vertically into three main strata or layers—a ground

FIG. 9.—Forest of western hemlock and Douglas fir on Tahoma Creek (Canadian Zone). (Photograph by J. B. Fleet, National Park Service)

stratum (including the forest floor), an intermediate stratum, and an uppermost stratum.

The forest floor is carpeted with mosses of two principal species, *Hypnum robustum* and *H. splendens*. Growing on this forest floor appear shade-tolerant species of plants, ranging from a few inches to several feet in height, able to live in the depths of the forest. Here are the bunch berry (*Cornus canadensis*), alpine beauty (*Clintonia uniflora*), birds-foot bramble (*Rubus pedatus*), vanilla leaf (*Achlys triphylla*), forest anemone (*Anemone deltoidea*), huckleberries (*Vaccinium parviflorum*, etc.), vine maple (*Acer circinatum*), devil's club (*Echinopanax horridum*), false Solomon's seal (*Vagnera sessilifolia*), and thimbleberry (*Rubus parviflorus*). In this ground stratum live the Oregon ruffed grouse and the western winter wren;

the Sierra hermit and russet-backed thrushes spend most of their time here. Almost all of the forest mammals except those which live principally in trees, like the flying squirrel, or in the air, like the bats, are found in this ground stratum. The wood rat, red-backed mouse, Cooper chipmunk and snowshoe rabbit are numbered among these ground dwellers. Many other mammals are regularly found on the forest floor, including the dusky shrew, black bear, marten, two kinds of weasels, bobcat, white-footed mouse, and Columbian black-tailed deer.

As the intermediate stratum is entered the number of plants and mammals undergoes a marked decrease while the number of birds increases. Practically the only plants able to live in the upper strata are the lichens, chiefly *Sticta pulmonaria* and several species of *Usnea*. The Douglas squirrel and flying squirrel are the principal mammalian inhabitants. These are bona fide residents of the intermediate stratum, though they are active in the ground stratum, too. Many other mammals occasionally or often climb trees, for example the black bear, fisher, marten, bobcat, cougar, and Cooper chipmunk. Birds of the intermediate stratum include the band-tailed pigeon, sharp-shinned hawk, western goshawk, California spotted owl, saw-whet owl, Kennicott screech owl, horned owl, Harris woodpecker, Gairdner woodpecker, Alaska three-toed woodpecker, northern red-breasted sapsucker, western pileated woodpecker, Sierra creeper, western flycatcher, Steller jay, gray jay, British Columbia evening grosbeak, Louisiana tanager, slender-billed nuthatch, red-breasted nuthatch, and short-tailed mountain chickadee. There are of course no hard-and-fast lines bounding any of these strata and birds may range freely into contiguous divisions. The American and white-winged crossbills and the Townsend warbler are perhaps more often found in the uppermost than in the intermediate stratum. The western golden-crowned kinglet and chestnut-backed chickadee are found in both intermediate and uppermost strata. With the possible exception of certain bats, no mammals occur exclusively in the uppermost stratum, though the Douglas squirrel and flying squirrel doubtless range into it quite freely.

Although deciduous trees, such as alders and cottonwoods, are scarce within the park, one group of birds, including the Gairdner woodpecker, western warbling vireo, California yellow warbler, and Oregon chickadee, prefers the deciduous forest habitat.

BURN

Before the regulations governing the park went into effect severe fires swept part of the subalpine forest. These have resulted in tracts of standing dead stubs or "ghost trees" with much fallen timber and

brush between. A large area on the Muddy Fork of the Cowlitz River and on Stevens Creek has also been repeatedly burned (see p. 9). The alpine burns recover very slowly, there being little apparent change within the last 30 years (Allen, The Forests of Mount Rainier National Park, 1916, p. 5.) At low elevations the forest recovers more rapidly. The importance of maintaining adequate fire protection is obvious.

Destruction of the climax forest throws back the vegetation into an earlier stage of development, in which, disregarding the minor stages, appear various species of brush and herbs as fireweed (*Epilo-*

FIG. 10.—"Ghost" trees in subalpine burn, Sunset Park. (Photograph by Walter P. Taylor, Biological Survey)

bium angustifolium), western bracken (*Pteridium aquilinum pubescens*), blackberry (*Rubus macropetalus*), thimbleberry (*Rubus parviflorus*), running pine (*Lycopodium clavatum*), huckleberries (*Vaccinium* sp.), subalpine lupine (*Lupinus subalpinus*), and squaw grass (*Xerophyllum tenax*). Food of certain kinds is more abundant in the burn than the climax forest, and we find here, among birds, the Oregon ruffed grouse, sparrow hawk, Pacific nighthawk, Lewis woodpecker, Gambel sparrow, golden-crowned sparrow, Townsend solitaire, western robin, mountain bluebird and western bluebird; and among mammals the black bear, red fox, various meadow mice, mountain beaver, jumping mouse, two kinds of chipmunks, and Co-

lumbian black-tailed deer. Bears, deers, and chipmunks are often particularly numerous.

Brush is of course a characteristic of burns, often occurring also on meadow borders and along stream courses. In addition to certain species of the birds listed above there are others which are characteristically brush inhabiting, such as the Oregon towhee, rusty song sparrow, Lincoln sparrow, slate-colored fox sparrow, lutescent warbler, Macgillivray warbler, and golden pileolated warbler.

Fig. 11. Scene [illegible] Mount Rainier [illegible] in background.
(Photograph by Walter P. Taylor, Biological Survey.)

MOUNTAIN CHARACTERIZED BY FREQUENT MOISTURE IN OF A ROCKY TYPE

ALPINE ZONE AND PUMICE SLOPES

Above timber line in the intervals between glaciers and snowfields appear rocky ridges, the so-called cleavers, and more or less extensive pumice fields. With increase in altitude both flora and fauna quite naturally become less abundant, until finally, a little above 10,000 feet on Mount Rainier, practically all life ceases. On the pumice fields and rocky ridges appear mountain pilots (*Pilea dryasa*), mountain sorrel, pygmy daisy, Lyall aster (*Eucnide lyallii*), Sitka [illegible], alpine buckwheat (*Eriogonum pyrolæfolium* [illegible]), [illegible] rock, Parry's phlox, golden aster (*Erig-*

ou aureus), mountain aster (*Oreostemma alpigena*), *Polygonum wberryi*, *Poa suksdorfii*, *Draba aureola*, and *Smelowskia ovalis*. irds include the Rainier white-tailed ptarmigan, golden eagle, Hepurn rosy finch, and American pipit. One mammal, the mountain at, makes its home here. Several others range into the habitat, nong them the red fox, Canada lynx, timber wolf, coyote, black ear, white-footed mouse, wood rat, mountain lemming mouse, largeoted meadow mouse, Cascade hoary marmot, and little chipmunk.

ROCK SLIDE

Stupendous amphitheaters, formed principally by the tearing away frost-split fragments of rock by glaciers, are a characteristic topo-

FIG. 12.—Rock slide (talus slope) near Narada Falls. (Photograph by J. B. Flett, National Park Service)

graphic feature on all sides of the mountain. Rock slides or talus slopes are the inevitable and necessary consequence of weathering in this region, and are conspicuous in the Hudsonian Zone, between altitudes of 4,500 and 6,500 feet.

Certain plants and animals have become well adapted to life in the rock slides, which furnish them with home and shelter. Among plants *Phegopteris alpestris*, vine maple (*Acer circinatum*), and mountain ash (*Pyrus occidentalis*) are often found on the rock slides. One mammal, the cony, is found exclusively in this habitat, though several others are frequently observed, these including the marten, two kinds of weasels, white-footed mouse, little chipmunk, mantled

ground squirrel, and Cascade hoary marmot. The Rainier white-tailed ptarmigan spends much time on the rock-slides, although it is more characteristic of alpine ridge, glacier and pumice slope.

GLACIER

It is difficult to know just where to place the "glacier" habitat, for though it is characterized by extreme moisture, this moisture is

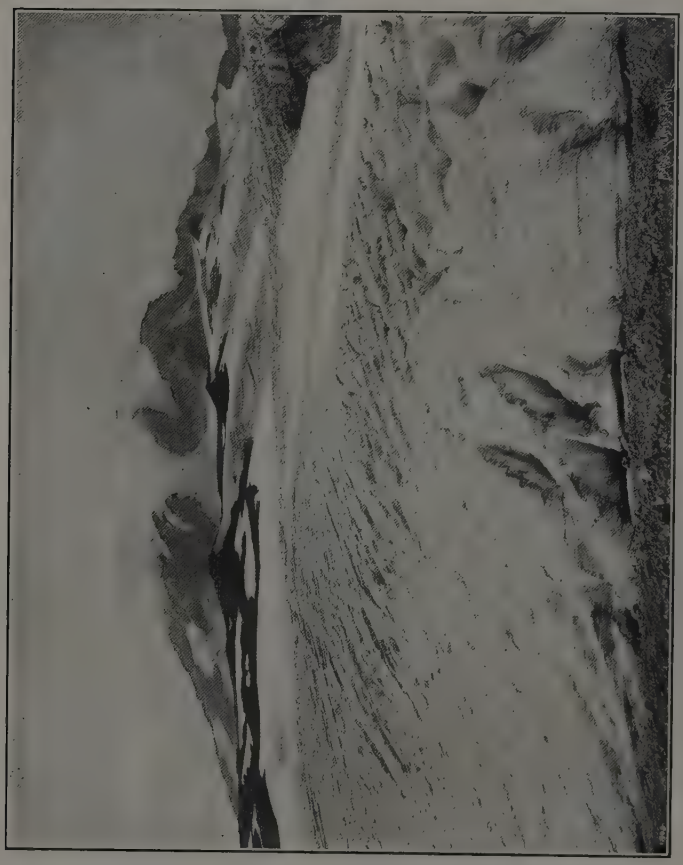

FIG. 13.—Nisqually Glacier. (Photograph by Asahel Curtis, National Park Service)

mostly unavailable, and the habitat is actually closely related, at least so far as its birds and mammals are concerned, to alpine ridge and pumice slope.

As is well known, several species of insects, chiefly members of the low order *Thysanura*, live on the surface of the glaciers; worms of the genus *Mesenchytraeus* occur plentifully on the lower parts of

the glaciers; and probably numerous microscopic plants are also to be found. The bacterium *Protococcus nivalis*, colonies of which make the patches of red snow, is conspicuous because of its color. (Matthes, Mount Rainier and Its Glaciers, 1914, pp. 16, 17.) The rock brake (*Cryptogramma acrostichoides*), stone crop (*Sedum divergens*), mountain alder (*Alnus sinuata*), and *Collomia debilis* grow on the moraines in such intimate relation to glaciers that they may almost be regarded as part of a glacier association.

While no birds or mammals are exclusive inhabitants of the glacier habitat, a number of them are occasionally or regularly found on the glaciers. These include the Rainier white-tailed ptarmigan and Hepburn rosy finch among birds, and two kinds of weasels, the marten, timber wolf, coyote, black bear, mountain lemming mouse, and mountain goat among mammals.

NEED FOR A GAME PRESERVE ADJACENT TO MOUNT RAINIER NATIONAL PARK

Game conditions in the park as well as throughout the region will be much improved when an area adjacent to the park is set aside as a game preserve. As the park boundaries are defined at present they embrace only the mountain and a comparatively narrow strip around it. The unfavorable winter conditions force the game mammals, such as mountain goats and deer, into lower country, and many of the deer normally move outside the park. The same effects undoubtedly obtain with game birds, such as ruffed grouse and quail.

The subject is somewhat complicated, since the interests of the counties concerned (Pierce and Lewis), the Federal Government (through the Forest Service and the National Park Service), and the State of Washington are all involved. A game preserve of adequate size adjoining the park should operate to make the reserved area a center of abundance of game, which would finally serve as a source of supply for all the surrounding area and be of great value to sportsmen and others in the immediate vicinity.

HOW AND WHERE TO BECOME ACQUAINTED WITH THE BIRDS AND MAMMALS

One can not expect to see or hear many wild creatures in hurried trips into the park by automobile or on hikes to cover country. Quiet wanderings in the vicinity of the camps or in remote and out-of-the-way places are essential for this purpose. Government ranger naturalists are always ready to assist the visitor in his search and conduct regularly scheduled daily field trips. Many birds and mammals resident near the hotels have lost much of their shyness and

are willing to make overtures to man for the sake of good things to eat which he so often carries with him. Some exceedingly timid species such as the bear and mountain goat must often be sought in unfrequented places where tourists seldom venture.

Binocular field glasses, while not essential, are extremely useful in studying the habits of wild animals. One may often descry in the distance such animals as marmots, deer, or bears by making careful long-range scrutiny of high mountain basins with the field glasses when first the panorama is spread before him. Binoculars are of great assistance also in following tiny birds in the thick foliage of conifers.

For the camera hunter there exist boundless opportunities for delightful occupation. He may try to outwit some of the keenest and most interesting birds and mammals in the Northwest, and if he comes off successful his pictorial trophies of the chase will give him an enjoyment which will grow with the years and give pleasure to all persons who may have access to them. The chance will sometimes come to secure absolute novelties and make important contributions to science. It must be conceded, however, that for success in this direction such reserves of patience and persistence are required as will probably prevent overcrowding of the field for some time to come.

THE MAMMALS

Wild mammals and birds, with the exception of a few harmful kinds, constitute a valuable natural resource. It is unfortunate that this has not been apparent to a majority of our State and National leaders in the past, for a number of valuable species formerly inhabiting North America have been exterminated and are now beyond recall, while others are threatened at the present moment. It is incumbent on every interested citizen to familiarize himself with the situation in his own vicinity. Accurate information concerning mammals and birds should be widely disseminated, and adequate conservation measures promptly adopted. The key to the whole problem lies in education and legislation.

Mammal study possesses infinite possibilities of popularization. In many respects mammals are even more interesting than birds, and the study of their life histories, including their nests, food, breeding habits, migration, hibernation, interrelationships, and individual characteristics promises to absorb an increasing proportion of the attention given to natural history. No bird could be of more absorbing interest than the Douglas squirrel, as it scolds you from tree trunk or branch; or the dusky shrew, as it explores the forest floor for edible objects; or the little chipmunk, as it runs about, a bundle of nervous energy, the personification of vivacity and good cheer; or the black-tail deer, perhaps the handsomest and most graceful of game mammals; or the mountain goat, denizen of glacier, snowfield, and rock slope.

The seasonal movements of the mammals on Mount Rainier are all too little known. In fact, while much additional information regarding birds is needed from Mount Rainier and elsewhere, the situation is much better with birds than with mammals. The field is large and fascinating, and one may make observations quite profitably wherever in the park he happens to be.

A few species of mammals, such as the broad-striped skunk, grizzly bear, and porcupine, are of hypothetical occurrence in the park. The skunk and porcupine should, and probably do, occur. It is doubtful whether the grizzly bear ever did range to Mount Rainier, but if so it must have been extinct there for a long time.

TOWNSEND MOLE[1]

(*Scapanus townsendii*)

Description.—Size moderate, head and body about 7¼ inches long; tail about 1½ inches; body robust; tail short, round, thick, and fleshy; head depressed; nose elongated into a snout; eyes minute, concealed in fur; legs short and stout; ear opening small; fore feet hand-like, fur dense, soft, velvety. In winter upper parts blackish brown or blackish, usually with a purplish sheen. The summer pelage is very similar, but is very slightly paler, with purplish sheen more pronounced.

Identification.—The moles may be known by their size, their silky pelage, hand-like fore feet, elongated snout, and apparent absence of eyes and ears. The Townsend mole is larger than the coast mole, the total length of the former averaging 8 inches or more, while that of the latter is nearer 6½ inches and proportionate in size.

Occurrence.—Probably found in small numbers on west side of Mount Rainier. One secured at Spray Park (5,500 feet).

Habits.—The ridges and hills of the Townsend mole are all too familiar to the prairie dwellers of western Washington, where the conspicuous piles of earth often interfere with farming. The species is apparently not common on the mountain, as few evidences of its presence were seen. A few were working about Spray Park.

COAST MOLE

(*Scapanus orarius orarius*)

Description.—Size moderate, head and body about 5¼ inches long, tail 1¼ inches. In winter pelage the upper parts are fuscous black or blackish, the under parts slightly paler and more grayish. The summer pelage is like the winter pelage, but is usually more brownish.

Identification.—See "Identification," under the Townsend mole, above.

Occurrence.—Probably occurs rarely on all sides of the mountain. Taken at Longmire (2,700 feet), Mesler's ranch (2,000 feet), and Owyhigh Lakes (5,100 feet).

Habits.—The habits of the coast mole are, so far as known, similar to those of its larger relative. Few mole ridges were seen on the mountain, most of those observed being on the west side.

GIBBS SHREW MOLE[2]

(*Neurotrichus gibbsii gibbsii*)

Description.—Size small, bulk about that of the house mouse; head and body a trifle under 3 inches in length; tail 1⅜ inches;

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[1] John Kirk Townsend, born in Philadelphia, Pa., Oct. 10, 1809; died in Washington, D. C., Feb. 6, 1851. A contemporary of Audubon, naturalist and explorer, connected with the staff of the National Institute in 1842. (See Dall, Spencer F. Baird, 1915, p. 75.) Townsend made a trip to the Rocky Mountains and Columbia River in 1834 and discovered the mole, warbler, solitaire, and fox sparrow afterwards named for him.

[2] Named in honor of George Gibbs, born July 17, 1815; died April 9, 1873. Eminent for his investigations in several branches of natural history, he specialized on ethnology and made valuable contributions to knowledge of the Indians of the Northwest. During his terms of service as collector of Astoria (1854 and subsequently), with the United States Government Boundary Commission, and as geologist under Gen. Isaac I. Stevens on the Northern Pacific Railroad surveys, and with the Northwest Boundary Survey, Gibbs had abundant opportunity to become acquainted with the natural history of the State of Washington.

tail moderately fleshy, constricted at base, sparsely covered with coarse hairs. Color of upper parts dark gray, the under parts similar, rarely slightly paler than the back; the longer hairs are frequently tipped with whitish, giving a frosted appearance.

Identification.—This tiny mole may be known by its small size, short and fleshy tail (sparsely haired and constricted at the base), and hand-like fore feet.

Occurrence.—Found all around the mountain, chiefly below 3,500 feet; however, one specimen was taken at Glacier Basin (5,935 feet). Others were captured at Nickel Creek (3,350 feet), Mesler's ranch (2,000 feet), Tahoma Creek (2,500 feet), and Longmire (2,700 feet).

FIG. 14.—Gibbs shrew mole. Note the naked, pointed nose; the spadelike fore feet; the soft molelike hair; and the thick hairy tail. From freshly killed specimen. (Slightly under natural size.) (Photograph from Biological Survey)

Habits.—Little is known of the life history of the Gibbs shrew mole. It is almost never encountered by the casual observer, and not often by the professional mammalogist. The animal is known to inhabit grassy swamps, muddy thickets, and the neighborhood of streams. At Tahoma Creek it was found living near beaver ponds. One was trapped on a moist muddy place in a mossy situation between two logs, another by a tiny burrow three-fourths of an inch in diameter beneath a mossy bank on a cushion of *Hypnum splendens* and *H. robustum*. At this point a small log, overgrown with moss and in a state of partial decay, lay so that for 6 feet or more it sheltered what appeared to be a shrew mole runway. In 1897 Dr. A. K. Fisher trapped two at Longmire in woods near logs shaded by skunk cabbage (*Lysichiton*). The food of the shrew mole, consisting chiefly of worms and insects, is doubtless obtained from old

logs, damp earth, and forest mold, in much the same way as with the shrews. The sense of touch, very highly developed in the slender nose, and undoubtedly also in the thick, hairy tail, probably makes up for any deficiency in sight and hearing.

DUSKY SHREW

(Sorex obscurus setosus)

Description.—Size small, length of head and body about $2\frac{3}{4}$ to 3 inches, tail about $1\frac{3}{4}$ to 2 inches. Upper parts dark brown in summer, blackish in winter; under parts ashy. Tail dusky above, pale below.

Identification.—The small size, brown color, almost invisible ears and eyes and pointed snout distinguish the shrews. The shrew mole is larger, darker colored, and has a fleshy tail; the water shrews

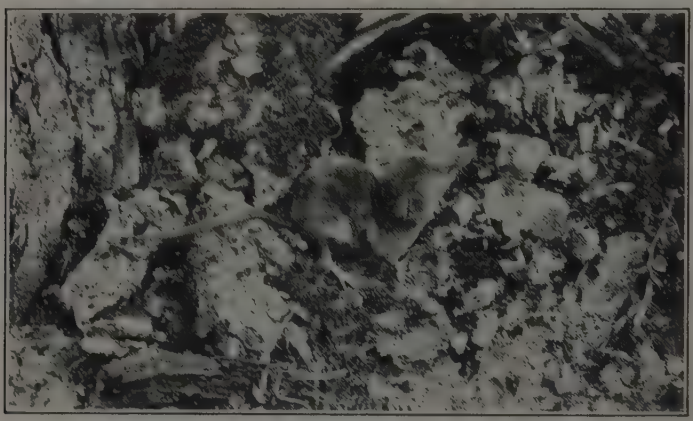

FIG. 15.—Dusky shrew. Taken at Sunset Park, from specimen posed in natural habitat. (About three-fourths natural size.) (Photograph by William T. Shaw, State College of Washington)

are larger, darker, and possess longer tails. It is impracticable to distinguish between the wandering and dusky shrews in the field. The dusky shrew is the commonest shrew in the park.

Occurrence.—From park boundaries to timber line. Specimens taken at Mesler's ranch (2,000 feet), Bear Prairie (about 2,000 feet), Reflection Lakes (4,900 feet), Ohanapecosh Springs (2,000 feet), Owyhigh Lakes (5,100 feet), Glacier Basin (5,935 feet), James Lake (4,370 feet), Spray Park (5,500 feet), Mountain Meadows (4,000 feet), Sunset Park (5,000 feet), St. Andrews Park (5,500 feet), Tahoma Creek (2,500 feet), Paradise Park (5,400 feet), Paradise Creek (altitude not known), west slope of Mount Rainier (5,400 to 6,800 feet), Longmire (2,700 feet).

Habits.—At first glance one might refer the dusky shrew to the mouse family, but close inspection demonstrates numerous points of difference. As a matter of fact, the shrew belongs to a different order of mammals, the Insectivora, which are ground-living animals with teeth of a primitive type and low brain development. The

animal is further characterized by having very small eyes and ears; but its slender sensitive nose, abundantly furnished with tiny vibrissæ, indicates highly developed senses of smell and touch.

Unlike the mole, the dusky shrew does not burrow for itself, but lives under logs, fallen bark or leaves, being sometimes found in the abandoned dens of small burrowing animals. It is not improbable that it has no fixed abode, but is a wanderer. Although more common than elsewhere beneath brushy tangles or berry vines in moist or swampy places, it is sometimes taken on dry hillsides in the shelter of valerian, huckleberry, or fireweed; and in August, 1897, in the Paradise Park region, Vernon Bailey caught one in a meadow-mouse runway in a mat of heather close to timber line.

Despite the fact that the dusky shrew is often active by day as well as by night, it is seldom seen, even where it is abundant. Its small size, absence of audible voice, and noiseless habits go far to render it inconspicuous. Furthermore, it usually remains under the grass and brush, foraging for insects or worms chiefly beneath logs, bowlders, or mats of leaves.

Cantwell reports that the shrew is sometimes found dead along trails where other animals have caught and killed but not eaten it, for, like the mole, it is seldom relished by predatory species owing to the strong odor given the flesh by certain glands of the body.

One's chance of seeing the little animal is best in the thick forest on cloudy days. A shrew was under observation for some time near Longmire on August 1. "It was almost dark beneath the dense hemlocks. The forest floor was moist and soundless. Presently a tiny object appeared in the trail, very small but animate and therefore interesting. On sprightly feet it toddled about, nosing here and there under bark and leaves in a persistent sort of way. It ran up a prostrate log a foot in diameter, sliding recklessly down the far side. Suddenly it turned into the trail and came steadily in my direction, even passing between my feet without seeming to detect my presence. For 15 minutes it continued its search, covering 75 yards during its wanderings. Once it entered a small hole in a mound, to reappear shortly a few feet farther on. Finally it disappeared into the earth near an old moldering stump." (Shaw MS.)

On another occasion, also at Longmire, a shrew was seen at about 7 a. m. on a foggy day. It ran over some dry needles near a tumble-down cabin. Running rapidly across an open space to the base of a tree, it remained for a time beneath some boards and branches piled there. Then it appeared in the open again, its pointed nose, rounded back, and brown tail being obvious characteristics. Its run was rapid, and its starting and stopping abrupt like that of a lizard. After two or three short runs it made a longer run into the forest and was lost to view.

While setting traps beside a small stream Cantwell saw a shrew visit a trap containing a freshly caught mouse. The animal started feeding on the mouse at once. "Its poor eyesight failed to detect me," he writes, "only a few feet away, but as a twig snapped beneath my feet the shrew dodged into a hole in the bank and did not appear again."

The little animals are active throughout the winter, and J. B. Flett has trapped them in his woodshed at Longmire during December.

WANDERING SHREW

(Sorex vagrans vagrans)

Description.—Size small, head and body about 2½ inches, tail about 1½ inches in length; body and tail slender, nose long and sharp, rim of ears showing slightly above surrounding fur; eyes minute dots; upper parts in summer dark brown, darker in winter; under parts grayish; tail dusky above, pale below.

Identification.—See under "dusky shrew," page 30.

Occurrence.—One specimen trapped at Bear Prairie, (altitude about 2,000 feet), 3 miles south of Longmire, only.

Habits.—The wandering shrew is the smallest mammal in the park region. So far as known, its habits are identical with those of the dusky shrew (see p. 30).

TROWBRIDGE SHREW [3]

(Sorex trowbridgii)

Description.—About three-fourths the size of a house mouse; head and body 2¾ to 3¼ inches, tail about 2 to 2¼ inches. Upper parts blackish or dark grayish, under parts dull plumbeous; tail sharply bicolor, blackish above, white below.

Identification.—See under the dusky shrew, page 30. The whitish under surface of the tail, contrasting strongly with the blackish upper surface, readily separates the Trowbridge shrew from others.

Occurrence.—In the southern part of the park, from the boundaries commonly to 3,000 feet. Specimens were taken at Mesler's ranch (2,000 feet), Ohanapecosh Springs (2,000 feet), and Tahoma Creek (2,500 feet).

Habits.—The habits of the animal are apparently similar to those of the dusky shrew. As a rule individuals are found on the forest floor or on damp ground in the vicinity of water, where brushy tangles and fallen logs afford them shelter. They are not restricted to such situations, however, but occasionally occur also on the hill slopes of the open park country. Here they take advantage of the shelter of old log piles or sometimes of huckleberry vines or other brush.

Like the dusky shrew, too, they are seldom seen in the daytime, and then only as one remains quiet in some shady part of the forest. A faint rustling of the dead leaves may then betray their whereabouts.

The Trowbridge shrew is not nearly so abundant as the dusky shrew.

NAVIGATOR WATER SHREW

(Neosorex palustris navigator)

Description.—Size about that of a house mouse; head and body about 3¼ inches, tail a trifle under 3 inches; feet conspicuously fringed with bristle-like hairs. Upper parts dark brown or blackish

[3] Named in honor of Lieut. William Pettit Trowbridge, who was born in Troy, N. Y., in 1828, and who died in New Haven, Conn., Aug. 12, 1892. In course of scientific work for the United States Coast Survey along the Pacific coast in 1853 to 1856 Lieutenant Trowbridge made extensive collections of birds and mammals for the United States National Museum.

with a slight gloss, appearing grizzled in some lights; under parts pale grayish, nearly white; tail brown above, pale grayish below. In the worn summer coat the belly is variously discolored with brownish and yellowish. The forefeet of the navigator water shrew are small; the hind feet are broader, and are provided, on the sides, with a row of stout comb-like hairs. This striking foot development, not unlike that of the muskrat, is an adaptation to its aquatic environment.

Identification.—The dark color and silky hair, pointed nose, and inconspicuous eyes and ears separate the water shrews from any of the mice; from the shrews they are distinguished by larger size; from the moles by longer, slenderer tail. The navigator water shrew is separable from the Bendire water shrew by its whitish rather than lead-colored underparts.

FIG. 16.—Navigator water shrew. Taken at Owyhigh Lakes from specimen posed in natural habitat. (Above two-thirds natural size.) (Photograph by William T. Shaw, State College of Washington.)

Occurrence.—From park boundaries to 8,000 feet. Specimens have been taken at Mesler's ranch (2,000 feet), Longmire (2,700 feet), Reflection Lakes (4,900 feet), Owyhigh Lakes (5,100 feet), James Lake (4,370 feet), Clover Lake, White River Park (5,700 feet), Tahoma Creek (2,500 feet), and Paradise Park (5,400 feet).

Habits.—That this shrew is at home in the water is well known. Cantwell frightened one of them from its mossy retreat in the bank of a swift mountain stream, and in making its escape into a hole farther down stream it ran swiftly through the shallow water, swimming or diving with great speed through the deeper pools. In swimming it used all four feet apparently with the same motions used in running over the ground. While under water the thick coat of fur was surrounded by a silvery layer of air, and when the animal came to the surface again it appeared to be quite dry.

The navigator shrew prefers swiftly running water where shelter is afforded by overhanging mossy banks, brush, or old log piles. A

favorite locality is the cascading outlet stream from a mountain lake or meadow. More rarely the shrew is found near quiet water.

The animal is nocturnal and seldom seen in the daytime unless accidentally driven from cover.

BENDIRE WATER SHREW [4]

(*Neosorex bendirii bendirii*)

Description.—Size about that of a house mouse, head and body slightly less than 3¼ inches; tail about 2¾ inches; feet large, fringed. Color, above and below, lead-colored or darker, in worn pelage sooty brown, slightly paler beneath; tail dusky all around.

Identification.—For identification of water shrews see under the navigator water shrew (p. 32). From the navigator water shrew the Bendire water shrew is distinguished by its lead-colored instead of whitish underparts.

Occurrence.—On west and southeast sides of park at or below 4,000 feet altitude. Zone, Transition and lower Canadian. Specimens were taken at Mesler's ranch (2,000 feet), Ohanapecosh Springs (2,000 feet), Mountain Meadows (4,000 feet), and Longmire (2,700 feet).

Habits.—So far as known the habits of this water shrew are like those of others of the family. Moist meadows, the borders of woods, and the lush grass or vegetation along lowland creeks afford suitable environment. Detailed information on the life and habits of the animal is almost wholly lacking.

SILVER-HAIRED BAT

(*Lasionycteris noctivagans*).

Description.—Size moderate; head and body a trifle less than 2½ inches; tail about 1⅝ inches; wing spread about 10 inches; longest finger about 2⅞ inches. Color, above and below, chocolate brown or blackish; many hairs on back and belly tipped with silvery white, the white tips most numerous on the middle of the back, absent, or nearly so, from face, crown, and throat.

Identification.—The dark coloration, frosted with silver, distinguishes this bat from any other in the park. In flight it appears larger than the northwest bat.

Occurrence.—Probably chiefly as a migrant; likely to be encountered anywhere in the park between the boundaries and timber line. Our only record is for Sunset Park (5,000 feet), specimen secured September 2.

Habits.—The bat is an animal of the twilight. Appearing as the sun dips below the horizon it is best seen against the crimson of the closing day.

> On drunken wings the flitting bat
> Goes staggering athwart the gloom.

[4] Named in honor of Maj. Charles Emil Bendire, who was born Apr. 27, 1836; died Feb. 4, 1897; eminent for his field investigations in natural history, particularly the life histories of birds. The type of this species of shrew was secured by Major Bendire near Fort Klamath, Oreg., while he was constructing a telegraph line from that place to Fort Bidwell, Calif.

It weaves between the slim candlelike alpine fir tips until, drawing nearer, it swirls through the eddying smoke of the camp fire. As the gloom settles, filling the near-ground spaces and blending the dark foliage with the shades of earth, it descends to a lower level.

The bat is an insect-eating mammal with sharp cuspid teeth well suited for the seizure of its aerial prey. It is adapted for flight by the development of long bony fingers which are furnished with a membrane of great pliancy, extending from the finger tips to the legs and on to the tail. When at rest the wings are folded along the sides of the body and, remarkable as it may seem, the bat hangs itself up to sleep by the short-toed hind feet, head downward. During the day the bat hides away from the sunlight in dark places about buildings, usually at some distance from the ground. In the mountains

FIG. 17.—Silver-haired bat. Taken at Sunset Park, from mounted specimen. (Slightly less than natural size.) (Photograph by William T. Shaw, State College of Washington)

it often edges its way under the partly detached bark of some old dead stub or finds shelter in the thick foliage.

Like those of shrews and moles, its eyes are not well developed, and probably its sense of sight is not of much assistance in securing prey, though unquestionably slight differences of light and darkness can be appreciated. The large ears of bats in general suggest that the sense of hearing is highly developed. J. Grinnell has suggested that the bat hunts its insect food by sound, and says: "Even the wing strokes of a tiny miller must be distinctly audible to the bat, which snaps it up so unerringly, and the droning of a June beetle must sound to the bat as penetrating as the roar of an airplane motor does to us." (Pacific Rural Press, vol. 85, 1913, pp. 344–345.) The sense of touch, too, may function largely in enabling the bat to avoid obstacles which can neither be seen nor heard.

The silver-haired bat is one of the few species of North American bats known to be migratory.

DARK YUMA BAT

(Myotis yumanensis saturatus)

Description.—Size small, head and body about 2 inches, tail about $1\frac{1}{2}$ inches. Color dark brown, paler below.

Identification.—Distinguished from the silver-haired bat by the absence of white or frosted hair tips; from the large brown bat by smaller size and darker color. Indistinguishable out of hand from the northwest long-legged bat.

Occurrence.—Taken at Sunset Park (5,000 feet) only, September 2, 3, and 9, 1919.

Habits.—This bat was fairly common at Sunset Park, where it was seen flying low among the mountain hemlocks and alpine firs or swooping over the lake near camp. One taken had a large insect in its mouth.

NORTHWEST LONG-LEGGED BAT

(Myotis longicrus longicrus)

Description.—Size small, head and body about $2\frac{1}{4}$ inches, tail about $1\frac{3}{4}$ inches. Color blackish brown above, paler below.

Identification.—See under the dark Yuma bat above. Indistinguishable in the field from the latter.

Occurrence.—Taken only at St. Andrews Park (5,500 feet), September 16, 1919, and Longmire Springs (2,700 feet), September 22, 1919.

Habits.—At Longmire the long-legged bat was commonly seen flying about the buildings. Small bats observed at Tahoma Creek (2,500 feet), assumed to be this species, avoided clearings, evidently preferring the gloom of the sheltering woods. The time of the bat's appearance depended on the amount of light. In thick-shaded alder woods it was noted as early as 6.25 p. m., September 20, 1919, but in the more open creek bottom the first individual was never observed until about 10 minutes later.

LARGE BROWN BAT

(Eptesicus fuscus fuscus)

Description.—Size moderate to large, head and body a little more than $2\frac{1}{2}$ inches, tail a trifle more than $1\frac{3}{4}$ inches; wing spread $9\frac{1}{5}$ to $11\frac{1}{5}$ inches; longest finger about $3\frac{1}{8}$ inches; ears short. Color light brown throughout (the tint subject to much variation), paler on belly than on back.

Identification.—The large size and slow steady flight of this bat help identify it in the field. In hand the size and brown color are distinctive.

Occurrence.—Doubtless a summer resident of the park below 4,000 feet; observed at White River entrance (3,100 feet), August 14; Ohanapecosh Hot Springs (2,000 feet), August 28; Mountain Meadows (4,000 feet), September 2; and Longmire (2,700 feet), September 28.

Habits.—The large brown bat often flies at somewhat greater height above the ground than the smaller species. On September 2 at Mountain Meadows one flitted through the hemlock forest about

8.12 p. m., but it remained so high that it could not be secured. Like all other bats within the State, the large brown bat feeds exclusively on insects and often becomes excessively fat. Adult females each containing one young have been taken in California in April and June. (H. W. Grinnell, Univ. Calif. Mus. Vert. Zool., vol. 17, 1918, p. 320.) Our ignorance of bat life histories is profound, and prolonged and intensive observation for the purpose of acquiring additional material is desirable.

BLACK BEAR; BROWN BEAR

(*Ursus americanus americanus*)

Description.—Head and body 5 or 6 feet; tail about 5 inches; weight usually between 200 and 300 pounds; body heavy, thickset, of awkward appearance; tail short; tracks somewhat resembling those of human foot; color black or brown, both phases occurring often in the same litter. The black phase often has a brown patch covering the muzzle and sometimes a white spot on the breast.

Identification.—Can be confused with no other mammal in the park.

Occurrence.—From park boundaries to several hundred feet above timber line. In summer more common than elsewhere in the Hudsonian Zone, 4,500 to 6,500 feet.

Habits.—The abundance of cover militates against observation of the black bear on Mount Rainier. As a rule, too, the animal is extremely shy, and one may wander through the park for weeks without seeing an individual, though tracks and droppings may be commonly noted. During huckleberry season the black bear remains in the Hudsonian meadows just below timber line, regaling himself on the luscious fruit. At this season as many as six have been seen together. When the supply of wild berries runs low the bear often visits the garbage piles in Paradise Valley and at Longmire or plunders road camps between. He is an expert at pulling over garbage cans so as to get at their contents. One bear thus engaged was surprised by a man who quietly slipped up behind him and gave a war whoop. The bear did not take time to back out, but, uttering a surprised *w-o-o-ch!* plunged forward with the can on his head and shoulders, barely missing a tentfull of tourists, and fetching up shortly by running full tilt into a large tree. The can, on examination by the mechanic, was pronounced a total wreck.

On the 8th of October, 1897, J. B. Flett and John Hershey were returning toward camp in Paradise Valley with a collection of plants. A short distance below timber line a small bear was encountered coming up the trail. The bear did not see them, but kept nosing on, wagging his head from side to side, probably looking for huckleberries. Presently Flett threw a mattock, which struck close to the bear. With a *wooch!* the startled animal ran for a craggy slope near by. About a third of the way down the slope, which at this season was covered with snow and ice, he lost his footing, rolling like a barrel to the bottom. Regaining his feet on a grass patch, he again caught sight of Flett, gave another *wooch!* and made remarkable speed over the snow banks, finally disappearing in the valley of Nisqually Glacier.

Bears are especially fond of butter, lard, and bacon. They are so clumsy that their presence around camp can be easily detected, and the least noise will scare them away. Some complaints have been registered against them, but in most instances the complainant, having left his meat or other supplies in a carelessly exposed place, is more to blame than the bear.

About the middle of July, while the snow still lay deep in the subalpine parks, a brown bear was sighted on a warm southeast-facing bench on the side of Satulick Peak. He was wallowing with evident enjoyment in a pool of water below a snow bank. His bath completed, he arose and shuffled over to a small fir or hemlock, rearing himself on his hind legs and apparently scratching himself. A moment or two of this satisfied him, and he loped across a snow bank and busied himself for several minutes in the huckleberry brush, apparently eating the fresh green leaves.

Possibly bears were more abundant on the northwest and west sides of the mountain, in Spray and Sunset Parks, than elsewhere. Here there was a profusion of the two shrubby huckleberries (*Vaccinium deliciosum* and *V. macrophyllum*). An individual noted in Sunset Park by Miss Mary R. Paschall and other members of the Mountaineers' Club did not take alarm until his nose apprised him of their presence. Although in full view, he had not appeared to see or hear them. Another individual, or perhaps the same one, observed in the same place by Flett, did not retreat, but slumped down on his haunches and calmly subjected Flett to inspection. Three bears are said to have been seen in Paradise Valley at intervals through the summer.

On September 8 a large brown bear was observed making off over a small glacier above St. Andrews Park. Tracks several times seen in the snow indicate that bears not infrequently wander about above timber line. Why they do this is not immediately apparent.

We are indebted to Harry Myers, of the Mountaineers' Club, and Maj. E. S. Ingraham, of Seattle, Wash., for information regarding the observation of a bear on the summit of the mountain. A party of four persons having been blizzard bound on the north rim of the little crater for two nights, were startled about 10 o'clock of the second morning to see a dark object entering the saddle from the west. The storm-bound men first thought it was a relief party coming to their rescue, but its closer approach revealed it as a bear. On reaching the rocks of the crater it paused, then turned about and started toward North Peak, behind which it disappeared from view. Major Ingraham suggests that the bear might have wandered out on the Tahoma Glacier from Indian Henrys and, becoming lost in the storm, instinctively climbed till it reached the summit.

Droppings and tracks observed supplemented actual observations of the bear and enabled us to determine its local distribution with some precision. The fecal matter was composed almost wholly of huckleberry leaves, seeds, and entire berries, though other vegetation, including unidentified leaves and grasses, was not rare.

Cub tracks were not seen before August 11, the first being observed at Sunset Park by J. Belden Richardson, of the Mountaineers. Thereafter tracks of the little fellows were seen not infrequently.

Alden Sampson saw an adult bear and two young in Spray Park in 1905. He writes: "The three seen on our excursion were gathering huckleberries on a hillside and were under observation for perhaps an hour, the mother eagerly satisfying her hunger and the young making repeated excursions of exploration from which each time they returned in a panic of apprehension until they had convinced themselves by actual touch that their friend and sheltering providence was still there. A more engaging spectacle of diligence and of content tempered with vigilance it would not be easy to find." (Sierra Club Bulletin, vol. 6, 1908, p. 34.)

Flett says the bear does not always hibernate in the Puget Sound country. About Mount Rainier an individual will occasionally winter in a ravine under a cliff where he is soon covered by deep snow. An approved hibernating chamber is a lava cave at the base of some basaltic cliff. Such a cave is often wide and roomy, and when provided with a good supply of limbs of trees and dry sticks makes an ideal shelter.

George Carrier, a trapper operating with headquarters at Bear Prairie, on ascending a hill above that locality in the fall of 1919, scared out a bear which had prepared his winter's couch under a young fir tree with long drooping limbs. The bear had dug a hole in the ground on top of a dry knoll and lined it with old branches. The early snow had apparently covered the animal, but a thaw had left him partly exposed. On Carrier's approach the bear slipped out through the dense undergrowth. The sticks where the bear had lain were still warm. Carrier was dragging a piece of horse meat for bait when he routed out the bear. Some time afterwards the bear followed the trail to the dead horse and destroyed the greater part of the best trap bait. Evidently this bear, finding living conditions favorable, preferred to remain active rather than to relapse immediately into hibernation. After November 7 no bear tracks were seen.

In the late fall Flett observes that bears feed on nearly all kinds of fleshy fungi, which, apparently, they do not use to any great extent at other seasons.

TIMBER WOLF

(*Canis occidentalis gigas*)

Description.—Size about that of a collie dog; length of head and body a little over 3 feet, tail 15½ inches; nose pad broad; ears prominent; legs strong, tail well haired, almost bushy. An October skin from the Olympic Mountains has upper parts brown sprinkled with blackish; many white hairs on shoulders; head dark brown grizzled with silvery white and blackish; ears whitish inside, rufous outside; legs mostly rufous, a line of black on inner side of forelegs; under parts much paler brown, almost whitish, with a sprinkling of blackish, especially on hinder portion of throat; forward portion of throat pale; chin black; a line of yellowish on midline of belly; tail above brown, growing more intense toward end, with much blackish insprinkled; end of tail black; tail below brown, most intense about two-thirds back. The winter pelage is darker. The young are dark brown in color, paler toward head and on under parts.

Identification.—The larger size, heavier head and limbs, broader muzzle, larger track and different voice of the timber wolf distinguish it from the coyote. The voice is more of a howl than the coyote's, which is usually a yapping bark interspersed with howls. The exposed nose pad is $1\frac{1}{4}$ to $1\frac{1}{2}$ inches broad in the timber wolf as compared with three-fourths to 1 inch in the coyote; the heel pad of the forefoot of the timber wolf is $1\frac{1}{2}$ to 2 inches as compared with 1 inch in the coyote.

Occurrence.—Limits of range within park unknown. Doubtless rare and of irregular occurrence.

Habits.—In 1897 Dr. C. Hart Merriam examined the hide of a timber wolf poisoned a few years before by a man named Carter on Little Bear Prairie, $3\frac{1}{2}$ miles south of Longmire. In color the animal was whitish buff, with the body and back hairs heavily tipped with black. Residents reported to Doctor Merriam that timber

FIG. 18.—Timber wolf. Headwaters of Clackamas River, Oreg. (Photograph by McMillan)

wolves were only rarely found in the general vicinity. The animals were, however, thought to be less rare on the mountain than in the Nisqually Valley. Dr. A. K. Fisher, writing at Longmire in 1897, said: "Wolves come down off the mountain in winter. They are described as large and very light in color."

Of late years J. B. Flett has noted timber wolves in the vicinity of Longmire in winter. In 1916 he saw two near Sluiskin Falls. Two dogs went in pursuit and engaged them in a fight on Mazama Ridge. The same year Jack Schidell, a trapper and guide, shot one near the end of Nisqually Glacier. Burgon Mesler, who has resided near Ashford, Wash., for 20 years, heard three wolves in 1916 howling at night on Skate Mountain just south of the park line. O. W. Curtis, former park ranger, says the animals still occur in the Carbon River region. Miss Crissie Cameron, of Tacoma, Wash., reports (in letter) that wolf tracks in the snow were seen by the Mountaineers at Paradise Valley January 1, 1920. C. A. Stoner, of Ashford, Wash., believes there are 25 timber wolves in the park.

MOUNTAIN COYOTE

(*Canis latrans lestes*)

Description.—About the size of a collie dog, head and body a little less than 3 feet, tail about 1 foot; slender, lithe, and graceful of form. Upper parts grayish buffy mixed with black hairs; muzzle pale cinnamon rufous; crown, nape, and ears tawny, deepest on ears; under parts whitish, more or less suffused with buff across middle of belly; long hairs of throat conspicuously tipped with black, forming a broad "ruff"; fore and hind legs and feet brown on outer side, whitish on inner side and on upper surface of hind feet; tail broadly tipped with black, its lower surface sometimes whitish on third closest to body, brownish on two-thirds nearest tip, or all the way.

FIG. 19.—Coyote. Burns, Oreg. (Photograph from life by William L. Finley and H. T. Bohlman)

In winter the pelage is longer and thicker, and the pelt much more handsome; the tail becomes a full haired brush, while in summer it is only thinly haired. There is little real color change in the winter, the chief difference being due to the length and thickness of hair, and the lesser amount of wear and fading to which it has been subjected.

Identification.—Though the total length of the coyote is nearly as great as that of the timber wolf, the animal has a smaller head, smaller teeth, narrower muzzle, and much more slender legs. The exposed nose pad (*rhinarium*) is ¾ to 1 inch broad, as compared with 1¼ to 1½ inches in the timber wolf; the heel pad of the fore foot is 1 inch in diameter as compared with 1½ to 2 inches in the timber wolf.

Occurrence.—Apparently found throughout the park, from the boundaries to timber line, but probably most abundant on the south side.

Habits.—Testimony of correspondents of the Biological Survey is almost unanimous to the effect that coyotes are increasing markedly in the vicinity of Mount Rainier. Twenty years ago the beasts were almost unknown in Pierce County, but at present they are reported abundant in many localities, especially in open cut-over lands.

Alden Sampson writes that in 1905 a considerable number of coyotes were present in the park, remarking that their call at night, "as thrilling and exhilarating a sound when heard in the forest as ever greets the ear of the mountaineer, is always a keen satisfaction to one who loves the wild life." (Sierra Club Bulletin, vol. 6, 1908, p. 35.)

On June 20 two coyotes were observed by J. B. Flett near Indian Henrys ranger cabin, 5,500 feet; exactly one month later Stanley G. Jewett saw one on the snow fields along the ragged crest of the Tatoosh Range, not far from Pinnacle Peak; and one was noted on Cowlitz Divide August 2 by R. S. Wainwright, of the Mountaineers. Late in September and during the first week in October coyotes were heard barking and howling at night or in the early morning at Longmire, Bear Prairie, and Mesler's ranch.

Miss Crissie Cameron, of Tacoma, Wash., reports that coyote tracks were seen at Paradise Valley by the Mountaineers' Club on New Year's Day, 1920.

Though occurring in suitable situations at any altitude, and occasionally even trailing through the woods, the coyote, at least in summer, is most commonly found in the open park country and on ridges at or near timber line. Examination of the excreta showed the animals to be living principally on rodents, including the Cascade hoary marmot and mountain beaver, as well as unidentified remains doubtless including chipmunks, conies, meadow mice, and the snowshoe rabbit. It is quite possible, of course, that some of the excreta examined belonged to the timber wolf.

The precipitous and open character of the Mount Wow Ridge, southwest of the mountain, renders it well adapted to coyotes and carnivores generally. Coyote signs were more abundant here and in the near-by Indian Henrys country than anywhere else in the park. There is some danger that this section may serve as a center of dissemination of predatory carnivorous animals for a considerable area of the surrounding country.

In other regions coyotes are well known to prey upon game, both birds and mammals. Thus Bailey found coyote signs along the higher trails in Glacier National Park composed almost entirely of mountain goat wool and sheep hair, and detected the hair of deer also. (Wild Animals of Glacier National Park, 1918, p. 84.) While we secured no conclusive evidence as to depredations of this character in Rainier Park, it should be recognized that coyotes are always a potential danger to deer and mountain goats. Perhaps the failure of these valuable game species to increase is partly due to the abundance and increase of coyotes. J. B. Flett, whose studies of goats on Mount Rainier are more extended than those of any other observer, is of the opinion that coyotes are the most destructive animals with which the goats have to contend.

CASCADE MOUNTAIN RED FOX; CROSS FOX

(*Vulpes cascadensis*)

Description.—Size of a small dog; head and body about 26 inches; tail 16 inches; muzzle pointed; ears erect, and giving face an alert, intelligent appearance; tail well haired, a typical fox "brush." In red phase the general color of head and upper parts is straw yellow; face from nose to eyes dull yellowish tawny; remainder of top of head and base of ears pale straw yellow; back golden yellowish tawny; tail very pale; black of ears and feet greatly restricted, that of fore and hind feet confined rather narrowly to upper surface and mixed with pale tawny.

In black-cross phase, top of nose grizzled brownish, sides of nose and imperfect ring around eye dusky or blackish, grizzled with whitish; top of head yellowish white, the black under fur showing through; dorsal cross (back and shoulders) blackish, overlaid and nearly concealed by yellowish white or buffy; sides of neck, flanks, and post scapular region behind shoulders golden yellow; two-thirds of ear, nearest end, black; forefeet black; grizzled above elbow with whitish and yellowish; hind feet and legs grizzled dusky and buffy, becoming nearly black on top of feet; chin, throat, and band down middle of belly black or blackish; inner sides of thighs washed with dusky. Tail black mixed with buff and tipped with white, in some specimens nearly all black to white tip.

Identification.—Smaller size than that of the coyote and conspicuous bushy tail mark the red fox; the tip of the tail is white in all pelages, while the timber wolf and coyote have black-tipped tails.

Occurrence.—Likely to be encountered almost anywhere in the park, but most abundant in the Hudsonian Zone above 5,000 feet.

Habits.—The red fox is probably more abundant in higher portions of the park than is generally supposed. Dr. A. K. Fisher reports that one was observed on a ridge near Nisqually Glacier the latter part of July, 1897. A tourist saw a fox on Ipsut Pass (5,000 feet), July 1, 1919, and fox tracks and droppings were not infrequently observed at higher altitudes by our party. Knife-edge ridges at or a little above timber line were favorite places of resort. Wallace Newsom, former park ranger, said two were trapped last winter not far from the park line between White River entrance (3,100 feet) and the Dalles of White River. J. B. Flett told us of a den on Mount Ararat near Indian Henrys where young were raised during the winter and spring of 1919. He reports that a trapper named George Carrier secured two foxes on the mountains above Bear Prairie 2 miles south of the park line during the winter of 1919–20.

Studies of the excreta indicated that the foxes were subsisting mainly on insects and fruit, the remains of huckleberries, leaves, and other vegetation.

As is well known, the red fox, cross fox, and silver-gray fox are color phases of the same species. So far as we are aware the occurrence in the park of the silver-gray fox has never been reported.

PACIFIC RACCOON; COON

(*Procyon lotor pacifica*)

Description.—Head and body about 20 inches, tail about 12 inches; body heavily built; head broad behind, with pointed muzzle, ears fairly large, pointed; limbs comparatively short, hind feet resting

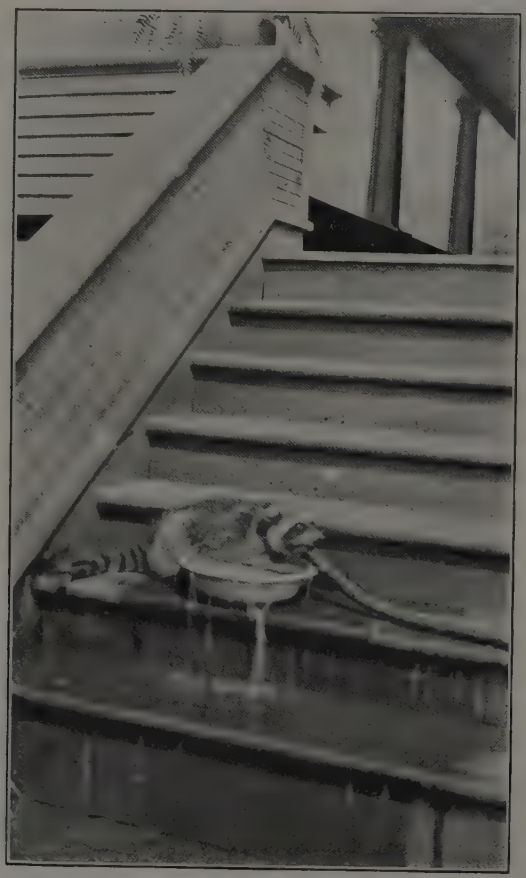

FIG. 20.—A playful raccoon. National Park Inn, Longmire. The animal has the fore part of its body in a basin of water. (Photograph from life by J. B. Flett, National Park Service)

flat on the ground. In faded summer pelage upper parts brown, grizzled with whitish; face and chin white with a broad bar of blackish extending from nose across face, including eyes, and joining a dark brown area on throat, not far from corner of mouth; tail light brown, encircled by six, more or less, dark brown or blackish rings,

tipped with blackish; ears whitish; under parts light brownish with many silvery hairs insprinkled. In winter the hair becomes thicker and longer, the color darker and the coat much more handsome. The difference is especially notable on the tail, which is sparsely haired in summer, but in winter forms almost a brush.

Identification.—The conspicuous blackish face marking and the black rings on the tail distinguish the raccoon.

Occurrence.—Transition and lower Canadian Zones below 3,000 feet altitude.

Habits.—J. B. Flett says the raccoon occurs in the vicinity of Longmire, though he has never seen it above that locality. Former Park Ranger Sherman Combs states that the raccoon is found in the vicinity of Ohanapecosh Hot Springs. In 1897 Dr. C. Hart Merriam found the animal abundant in the Nisqually Valley.

During the winter of 1918–19 a raccoon visited Flett's cabin every evening about 9 o'clock. If the animal found its dish empty it would rattle the plate to attract attention. Flett, on responding, would find the coon sitting erect either alongside or in the dish. The kind of food provided made little difference, for there was nothing left in the morning. Even beans, which animals rarely touch, were eaten with relish.

As Flett approached, the animal would slowly move off the porch and wait until the food had been placed on the dish, when it would clamber back and begin eating. Flett found that he could stand in the doorway without alarming the coon, but when he stepped down onto the porch the animal would inevitably step off onto the ground. The coon makes a great show of ferocity, and if engaged in a quarrel will spit and make various vicious sounds, besides grabbing for its opponent with open jaws.

NORTHWESTERN MARTEN; PINE MARTEN

(*Martes caurina caurina*)

Description.—Head and body about 16 inches, tail 8 inches; arboreal in habit; weight about 6 or 8 pounds; tail bushy, appearing half as long as body; ears moderate. Color rich dark tawny brown, darker on middle line of back and on tail, sometimes also on legs; face somewhat grayish; ear linings dull whitish, and large irregular patch of pale buff or orange on throat and breast. There is considerable variation in color in a given locality.

Identification.—The size, pale face, smallish rounded ears, dark-brown back and tail, and salmon-colored under parts should permit the ready identification of the animal. Seton writes that when seen in the trees it gives the impression of a large dark squirrel, with white ears and a yellow throat, on the ground looking like a dark-colored young fox.

Occurrence.—Park boundaries to timber line. In summer doubtless more common than elsewhere in the Hudsonian Zone, 4,500 to 6,500 feet. Specimens from the following localities are in the collection: Paradise Park (6,500 feet), Paradise Creek (5,100 feet), Sunset Park (5,000 feet), Spray Park (5,500 feet).

Habits.—This handsome mammal is common in the park, and, though chiefly nocturnal, is not infrequently observed by day. It is reported to be more than usually abundant in the vicinity of Mount

Wow, on the headwaters of Kautz Creek, about Chenuis Lakes, and on White River. It is abundant in the higher country in summer, descending in winter to lower altitudes.

In 1914 Ben Longmire caught 35 martens in the southwestern portion of the park, and in 1916 Jack Schidell captured about a dozen in the same region. J. B. Flett has seen the marten on Paradise River;

FIG. 21—Marten. The animal has a handsome face and an alert, interested expression. (Photograph from life by O. J. Murie, Biological Survey)

and on July 15, 1919, Park Ranger Claude Tice saw one at Narada Falls, 4,500 feet. On August 5, two were noted in front of a steep cliff not far from Summerland, 6,000 feet. Three days later one was observed near Glacier Basin, 5,800 feet. Flett saw a marten late in January, 1920, at 5,900 feet altitude above the hotel in Paradise Valley. The animal was not, as usual, hunting about the tree clumps but was traveling across country.

As two observers were walking down the road a short distance below Glacier Basin on August 8 a marten was noticed on a flume over the trail. The animal was somewhat nervous, but appeared more curious than frightened, remaining within 50 feet as the travelers passed by. One of the observers walked on ahead, while the other remained to watch the marten. The animal appeared to think both had gone, for it became nonchalant, scratching the side of its neck with its hind foot and making itself generally at ease. Finally it ran off over the flume and disappeared. The gait was an easy lope, with the tail drooping.

In 1897 Dr. C. Hart Merriam's party found the marten common on the mountain as well as in Nisqually Valley. Dr. A. K. Fisher caught three in a small isolated clump of dwarf firs close to Paradise Glacier. About the same time Doctor Merriam and Vernon Bailey caught additional specimens on the southeast side of Paradise Creek Valley. The animals were feeding upon conies and large-footed meadow mice.

The marten seeks its own course through the woods and does not usually keep to trails, as do coyotes and often bobcats. It is easy to trap if one can find where it is running. Cony rock slides at the timber's edge are a favorite place of resort. When caught, the animal growls and spits like a cat, but shows none of the ferocity of a weasel. Even when caught by one toe only the marten will usually not escape, for, unlike the coyote and many other carnivores, it seems to lack the nerve to break away.

The market prices for western and northern marten, quoted by the Seattle Fur Exchange as of May 7, 1926, ranged from $10 to $50. With so brisk a demand for its pelt, the animal is doomed outside of game preserves and parks unless unusually vigorous efforts are made for its conservation.

PACIFIC FISHER; PEKAN; PENNANT MARTEN

(*Martes pennanti pacifica*)

Description.—Head and body about 23 inches, tail 14 inches, weight averaging perhaps 8 to 12½ pounds, the female smaller; body long, legs short, resembling the marten in general characters, but much larger. Color grayish brown or brownish black, darker below; darker, sometimes quite black, on snout, ears, hind quarters, feet, and tail; head, neck, and shoulders with a grayish cast; ears with pale linings. The animal varies greatly in color. Irregular spots of white may be present in the chest region and at base of tail below.

Identification.—The fisher, according to Seton, when in the trees suggests a big black cat with a bushy tail, on the ground looking more like a black fox. The combination of large size and dark color distinguish the fisher from all its relatives.

Occurrence.—Without doubt extremely rare in the park. Likely to be found anywhere between the boundaries and timber line.

Habits.—Few mammals are more handsome than the fisher. As has long been recognized, this appellation is a misnomer, for it is not known to catch fish, although it eats them when available. Mice, squirrels, and other rodents doubtless constitute the staples in its

diet, though other items on the fisher menu are numerous and interesting. The most surprising of these is the porcupine. Dr. C. Hart Merriam writes: "It is indeed remarkable that an animal no larger than the one now under consideration should habitually feed upon a beast in whose capture he must be pierced with numbers of large and sharp needles, many of which exceed 2½ inches (64 millimeters) in length—needles that are destined to penetrate to the remotest parts of his body." (Mammals of the Adirondacks, 1884, p. 50.) As supporting the remarkable statement which concludes the quoted paragraph it should be added that on dissection of a large male Doctor Merriam found many quills embedded in the muscles of the head, chest, back, and legs, as well as in some of the deep muscles and ligaments about the joints.

Doctor Merriam reports fishers rare in the Nisqually Valley in 1897, but states that a few are taken every winter. According to former Park Rangers Sherman Combs and O. W. Curtis, a few fishers still occur on Mount Rainier. J. B. Flett says the latest definite records are those of a fisher trapped in the park by C. A. Stoner, of Ashford, about 15 years ago, and one secured by Sam Estes about the same time 4 miles down the road from Longmire.

Apparently the fisher has never been abundant anywhere; there is no doubt of its scarcity at present. Its beautiful pelt has stimulated trappers to its unremitting pursuit. The market prices for fisher skins, quoted by the Seattle Fur Exchange as of May 7, 1926, ranged from $20 to $125. With these unusual rewards in sight the fisher, like the marten and other valuable fur-bearers, is due for early extinction outside of preserves unless vigorous steps are taken to save it.

WOLVERENE

(*Gulo luscus*)

Description.—Length of head and body about 26 to 29 inches; tail 7 to 9 inches; weight about 25 pounds; body heavy in appearance, squat and low built; head broad and rounded; muzzle short and pointed; legs short, but very strong; feet armed with short claws; ears small; tail well haired, bushy. Color blackish, or deep dusky brown, with a broad band of yellowish brown or chestnut, sometimes fading to a dingy brownish white, beginning behind the shoulders, running along the sides, and turning up to meet its fellow on the rump and base of the tail, circumscribing a dark area on the back; a light colored grayish area on the front and sides of the head. On the throat and between the fore legs there is a patch or several irregular spots of light color; legs, feet, most of tail, and under parts generally blackish. Young animals incline to be darker than adults, and there is much variation in color.

Identification.—The size and peculiar markings of the wolverene (light-colored area on front and sides of head; also on sides of body, rump, and base of tail; the two areas in strong contrast to the dark color of the animal generally) distinguish it from all other park mammals.

Occurrence.—Found irregularly and rarely about the mountain.

Habits.—Ever since the days when the hardy Canadian voyageurs carried their trap lines into the unexplored wilderness the wolverene

has been known for his mischievous disposition. A favorite habit was to follow the trap line and destroy animals in the traps. Conflict between trapper and wolverene was inevitable, and many accounts of pioneer days in the north country have referred to Carcajou and his diabolical propensities.

The wolverene, if ever common, has undergone a marked decrease throughout the Cascade Range, probably due to the increasing price put on his pelt by the fur trade. About 1892 James McCullough, of Ashford, had two beavers stolen from his traps near Bear Prairie. He put out poison on beaver meat for the marauder and found two dead wolverenes as a result. In 1897 Dr. C. Hart Merriam found the animals rare on Mount Rainier.

J. B. Flett says a wolverene was killed a mile below Longmire about 1904 by a former park ranger named Sam Estes. A few years ago wolverenes gnawed through a cedar box and stole some bacon from the old Longmire house at Longmire Springs. Former Ranger Sherman Combs, of Lewis, Wash., reports a wolverene killed about 1915 on a mountain near the Muddy Fork of the Cowlitz River; and Wallace Newsom, formerly park ranger at White River entrance, asserts that a wolverene was killed in the winter of 1918 on White River just outside the boundary of the park.

Though seldom or never seen by the casual traveler, the wolverene is a distinct asset in the park. It is to be hoped that his numbers may increase, though not, of course, unduly. The passing of even a species that does some harm is a tragic event. Where possible, the balance of nature should be left to establish itself.

PACIFIC MINK

(*Mustela vison energumenos*)

Description.—Head and body 16 to 17 inches, tail 7 or 8 inches in length; weight of males 1½ to 2½ pounds; the females are smaller and somewhat lighter; slender bodied; tail long and bushy; pelage loose, but thick enough to resist water, with no seasonal changes; ears low; habits semiaquatic. Color dark brown, darker and glossier on the back, deepening nearly to black on the tail; chin sometimes white; usually with irregular white spots on throat, breast, and belly.

Identification.—Darker color, superior bulk, and bushy tail distinguish the mink from any of the weasels. From the marten and fisher it is separated by smaller size and more uniform and darker color.

Occurrence.—Reported to occur commonly along streams at lower levels in the park; i. e., in the Transition and Canadian Zones.

Habits.—Several members of the mink family have a propensity for wandering, and the mink itself is no exception. Man, guiding himself almost wholly by his eyes, can scarcely appreciate the keenness of the sense of smell in animals generally or the degree to which this sense supplements their powers of vision. Seton refers with insight to a traveling mink in the following words:

> As it journeys, it is ever on the alert for guidance from its nose. There are a thousand accidents to turn its steps one way or another; the cluck of a grouse, the rustle of a mouse in the grass, an easier path, a promising

odor in the wind, the wind itself may each and all give trend to its tireless bounding and bring the hunter at last to some marshland of promise. * * * (Life Histories of Northern Animals, 1909, p. 886.)

As is well known, the mink feeds very largely on fish, which it captures itself; but it does not refuse frogs or rodents when fish are scarce or unobtainable. Not infrequently, too, it attacks, kills, and eats rabbits; and when in farming country sometimes invades the poultry yard, to the great detriment of the latter. It lacks the insane blood lust of the weasel, however, and the damage done by the mink is usually the result of successive visitings rather than of one wild orgy of killing.

According to Dr. C. Hart Merriam, mink were common in the Nisqually Valley in 1897. Signs of mink were seen by our party at Ohanapecosh Hot Springs as well as near Longmire; and former Park Ranger O. W. Curtis saw a mink at Carbon River Ranger Station the last of August.

J. Hooper Bowles and Fred Edwards, of Tacoma, Wash., assert that there has been a decrease of 50 per cent in these and other fur-bearing animals in the Rainier National Forest area during the last 25 years, which, in view of the rise in price of furs, would not be unexpected.

WASHINGTON WEASEL

(*Mustela washingtoni*)

Description.—Size large; head and body of males averaging about 10 inches, tail 5¾ inches; head and body of females about 8½ inches; tail 4¾ inches; body slender, almost serpentine; legs short; ears small; head low; tail round and close haired. In summer pelage upper parts dark brown (sayal or snuff brown), darkening on head and face; irregular white spot or spots sometimes present on nose; tail uniform brown all around, with black tip; chin, upper part of throat, and lower portion of face white; under parts pale yellow (baryta yellow) or darker (light orange yellow).

In common with some other weasels, this species may or may not assume a white coat in winter, depending on altitude (or latitude) and consequent differences in climate. In drab winter pelage the upper parts are much paler brown (vinaceous-buff to wood brown); end of tail black; under parts whitish, sometimes washed with pale yellowish. In white winter pelage the animal is white all over, except black tip of tail, and the tail, rump, and belly, which are suffused with yellow.

Identification.—The snake-like body, short legs, and the body color distinguish the weasel from all other mammals in the park. The tip of the tail is black in all pelages. The Washington weasel differs from the little weasel in being considerably larger.

Occurrence.—From park boundaries to timber line. More abundant than elsewhere in the Hudsonian Zone between 4,500 and 6,500 feet altitude. Specimens were taken at Spray Park (5,500 feet), Glacier Basin (5,935 feet), and Owyhigh Lakes (5,100 feet).

Habits.—Although the weasel is trim in appearance and of bright and intelligent physiognomy, there is something serpentine about his long, sleek body which prejudices one against him at first sight. Nor does one's opinion of the animal greatly improve on more intimate

FIG. 22.—Washington weasel. Few animals exceed the weasels in untamableness, aggressiveness, and downright ferocity. Taken at Owyhigh Lakes, from specimen posed in natural habitat. (About one-half natural size.) (Photograph by William T. Shaw, State College of Washington)

acquaintance. He is aggressive and ferocious, belligerent, and bloodthirsty. A redeeming feature, perhaps, is his utter fearlessness; when cornered he will fight to the last against any odds whatsoever. Efforts to photograph the animal alive usually result in failure, since he is quite untamable, at least in the adult condition.

The great strength and muscular development of the animals is shown from the fact that they were frequently caught by the neck in strong traps but remained alive and apparently uninjured for some time, the same style of trap killing almost instantly animals of the size of tree squirrels and wood rats.

The length of the weasel's body and the shortness of his limbs enables him to thread his way with facility into the winding shafts and tunnels of the pocket gopher, large-footed meadow mouse, and other small rodents. The stomachs of weasels taken in the gopher country almost invariably contained remains of these animals, with occasionally red-backed mice and deer mice; and where the cony was abundant it became an important item in the weasel dietary. One weasel was found to have feasted on a junco, another on a flying squirrel.

At Owyhigh Lakes, where pocket gophers were plentiful, seven weasels were caught in a week. One morning a weasel was found running excitedly about a trap into which one of his kind had blundered during the night. In the gopher country they were often seen poking their heads up over the grass tops or darting quickly in and out of the burrows, here one second, there the next, giving the impression that the place was full of weasels.

A weasel was observed at St. Andrews Park running nimbly across an open space on the hillside. After reaching cover he reconnoitered the vicinity in a more leisurely manner. Shaw writes:

> I began to imitate a young or wounded bird in distress. Instantly he paused and wheeled about, moved his reptilian head and neck back and forth in the direction of the sound, and set his nostrils and vibrissæ in sensitive activity. Cautiously he approached, but not hearing the sound repeated he started on his way. The same sounds again called him about, and making a detour for protection's sake he came this time so close that I could have touched him with a long fish pole. There was no doubt as to his intentions. Unfortunate, indeed, would have been the little ground bird in his path.

Weasels possess anal glands similar in position to those of the skunk. These glands secrete a fluid of powerful and penetrating odor. The secretion evidently possesses a directive or informative function, registering, as it were, the visits of individuals to particular places in characters easily read by the sensitive noses of their fellows. Baits scented with the fluid are quite certain to attract other weasels.

When hurt, weasels utter a series of shrill squeaks, which are recognized by the chipmunks, and doubtless by other denizens of the neighborhood. On hearing the plaintive squeaking the chipmunks always burst into a chorus of excited chipperings.

J. B. Flett saw a weasel in white winter pelage at timber line above Paradise Park, December 29. The tracks of another were seen December 31 at the same altitude. The animal had been hunting from rock to rock and from one tree to another.

In the immaculate winter coat the weasel is known to the fur trade as ermine. In the made-up skin the dark tail tip is often sewed to the center of the back, giving the impression that ermine have a black spot in that region.

LITTLE WEASEL; STREATOR WEASEL

(*Mustela cicognanii streatori*)

Description.—Size much smaller than the Washington weasel; head and body of males about 6⅝ inches in length; tail 3½ inches; of females about 5¾ and 2 inches, respectively. In summer pelage the upper parts are uniform dark chocolate brown, darkest on head, often encroaching on belly and throat, the under parts narrowly and irregularly whitish, usually faintly tinged with yellowish; terminal third of tail black. In winter pelage, at low altitudes, the color of the upper parts is paler and the toes may be white; at higher altitudes a pure white coat is assumed, except that the end of the tail always remains black.

Identification.—The color, the long slim body, and the short legs separate the weasel from other animals. The smaller size of the little weasel distinguishes it from the Washington weasel. In general characters the two animals are much alike.

Occurrence.—From park boundaries to 6,000 feet altitude, all around the mountain, more abundant at lower altitudes. Specimens were taken at Mesler's ranch (2,000 feet), Paradise Park (5,400 feet), Reflection Lakes (4,900 feet), Longmire (2,700 feet), Glacier Basin (5,935 feet), Lake James (4,370 feet), Ohanapecosh Springs (2,000 feet), and Bear Prairie (about 2,000 feet).

Habits.—While this is the smallest truly carnivorous mammal in the park, it is by no means the least interesting. While only a few inches long and weighing but a few ounces, it is a handful of devilish energy, compensating for its small size by its extraordinary strength and agility.

As contrasted with the larger Washington weasel, which is more abundant in the high alpine park country, the little weasel is more often found at lower levels either in the timber, about meadows, or along watercourses. At the same time it occurs at higher altitudes. Thus the ranges of the two species overlap over a considerable area.

We found the little weasel to be living on conies and different species of mice. There is little doubt that it is dreaded by wild creatures generally, for it is bloodthirsty and cruel, giving no quarter, and killing, often, for mere lust.

The little weasel travels about with arched back, bounding along by leaps, and being as much at home in trees as on the ground. With its slender body and short legs it is admirably adapted to enter the small-caliber burrows of mice of different species; and, with its smaller size, has, perhaps, a distinct advantage over its larger fellow, the Washington weasel. The animals may often be seen on talus slopes in which conies are living. A little weasel noted on a rock slide at Reflection Lakes was apparently carrying a portion of a cony, and at intervals disappeared from view beneath some large bowlder, to reappear in a moment a little farther on. When the ob-

server made a squeaking noise the weasel came to attention, senses all alert, on a rock in full view, facing in the direction of the unusual sound.

The two-story frame "hotel" building of the Mount Rainier Mining Co., at Glacier Basin, was fairly alive with mantled ground squirrels, wood rats, white-footed mice, and little chipmunks. One day a little weasel entered the building through a knot hole in the floor. Almost at once it encountered a tray of stuffed specimens of mice which had been set to one side to dry. The actions of the weasel indicated immediate and lively interest. It was hindered from getting at the specimens, however, by a strip of mosquito bar placed over the trays to guard against flies. Several persons gathered only a few feet away to watch the weasel's actions. It paid scant attention to its audience, merely dodging a couple of times behind a pile of lumber within the room, and quickly returning to the specimen tray. The episode progressed rapidly to its denouement when some one intervened with a shotgun and the little weasel himself became a specimen.

On March 29, 1920, one of these weasels in his coat of "ermine" appeared in the snow near J. B. Flett's cabin at Longmire. The animal seemed at home in the soft snow, moving irregularly but rapidly and easily avoiding capture.

Weasels, both large and small, were not uncommon in the park. Considering, however, the extraordinary abundance of rodents, one can not help wondering why the little carnivores are not even more abundant. They seem to possess unusual hardihood and superabundant vitality. Evidently there is some effective check upon their increase; we do not now know for certain what it is, but we may congratulate ourselves upon its existence.

LITTLE SPOTTED SKUNK; OLYMPIC SKUNK; POLECAT

(Spilogale phenax olympica)

Description.—Head and body of males approximately 12 inches in length, tail about 4½ inches; females somewhat smaller; head proportionately small, muzzle pointed; body bulky, particularly toward hind quarters. Color black, with white spot on forehead, four white stripes running lengthwise from the head to a point one-third to one-half the way to the tail; sides and posterior part of body with white patches and stripes; tail flattish and well haired, black with extensive white area near end; the white area more expanded below and becoming conspicuous when tail is elevated to serve as a warning banner; under parts black.

Identification.—The skunk, with its black and white coloration, deliberate movements, and almost defiant bearing, is well known to nearly every dweller or traveler in the country. The little spotted skunk (so far the only species reported from the park) is considerably smaller than the "broad-striped" Puget Sound skunk, and, in addition, possesses four narrow lengthwise white stripes, while the larger skunk has two broad lengthwise white stripes, which coalesce in the region of the shoulders.

Habits.—The independence and nonchalance of the skunk, due to its effective odor device, are well known. According to Howell the

little spotted sunk is more agile than its larger relative of the genus *Mephitis* (North American Fauna No. 26, 1906, pp. 7–9). Hollow logs or stumps ordinarily furnish home site and shelter, but it is not at all averse to exploring the vicinity of human camps or habitations, and not infrequently takes up its abode beneath buildings. It has even been known to come boldly into occupied cabins.

The food habits of the skunk are partly beneficial and partly harmful. Hen's eggs are known to have been eaten, on occasion, and doubtless bird's eggs also are consumed. On the other hand, rats, mice, and other small mammals, and many insects are devoured; in fact, insects apparently constitute the largest item in the skunk's dietary.

In parts of the West out-of-doors men have a wholesome fear of the little spotted skunks because of known instances of hydrophobia contracted from their bites. Prof. Charles T. Vorhies, of the University of Arizona, has collected evidence which indicates that skunks are rather more apt to bite sleepers than are coyotes, wolves, and dogs; also that perhaps a rather larger proportion of bites from skunks produces rabies than of the bites from any other animal. Statistics on over 3,000 cases of rabies, however, indicate only 1 per cent infected from skunks, so that, after all, the total showing is not great. Doctor Vorhies concludes that in case of skunk bite the Pasteur treatment should be promptly taken. (University of Arizona Agricultural Experiment Station, Bulletin No. 83, 1917, pp. 368–373.)

In 1897 Dr. C. Hart Merriam found little spotted skunks fairly common in the Nisqually Valley up to the base of Mount Rainier. J. B. Flett noted a skunk on Tahoma Creek on December 21, 1919. He has also seen the animals at Longmire and at Wilkeson, Wash., north of the park. James Brantner observed a skunk at Carbon River Ranger Station in 1915.

PACIFIC RIVER OTTER

(*Lutra canadensis pacifica*)

Description.—Head and body about 27½ inches in length; tail about 14½ inches; weight of a male about 17 pounds; body stout, elongate; head small, neck without constriction; legs comparatively short; well adapted to a swimming habit, possessing a flexibility of body almost eel-like; feet webbed; tail thick and muscular, tapering toward tip; the over hair is close set, and there is abundant woolly under fur. Color dark brown above and below, under parts paler, the under surface of head, throat, and breast palest.

Identification.—The larger size, less conspicuous ears, more eel-like flexibility of body and more uniform brown color distinguish the otter from the fisher. The habits, too, are very different, the otter being aquatic, the fisher terrestrial and arboreal.

Occurrence.—Not recently reported; doubtless an occasional individual enters the park.

Habits.—The otter is an exceedingly wary animal and succeeds wonderfully well in avoiding observation; nevertheless, it is feared that the number of the animals remaining is so much reduced that the continued existence of the species is endangered. This is in

highest degree unfortunate, for the otter, while feeding on some fish, is extremely valuable for his beautiful close-furred pelt, and, in addition, is well known for his interesting habits. He possesses a noteworthy wanderlust and is said to be constantly on the move up and down the water courses on which he lives, or crossing from one to another. In this way he covers much country.

> Otters are extremely playful and amuse themselves by sliding down steep banks into the water, repeatedly using the same place until a smooth chute or slide is defined. They usually have two to five young, which remain with the mother until nearly grown. (Nelson, Nat. Geog. Mag., 1916, p. 445.)

Otter skins have long been in urgent demand by the fur trade, and it is certain that this has been a large factor in the diminution of the animals. Careful investigations of the status of fur-bearing mammals, with speedy enactment of beneficial legislation, are desirable in all States in which they constitute an appreciable natural resource. Reserves of comparatively limited area, such as Mount Rainier National Park, avail little in the conservation of an animal with the wandering proclivities of the otter.

Dr. C. Hart Merriam (MS.) reports otters as fairly common in the Nisqually Valley in 1897; and J. B. Flett told us that Ben Longmire used to catch the animals in the park 20 years ago. C. A. Stoner, guide and timber cruiser, Ashford, Wash., believes that otters are holding their own in the Rainier region or even increasing slightly. Some out-of-doors men, on the other hand, believe the animals are practically or quite extinct, and the consensus of opinion of correspondents of the Biological Survey is that otters have decreased in this area from 50 to 80 per cent in the last 25 years.

NORTHWESTERN COUGAR; MOUNTAIN LION

(*Felis oregonensis oregonensis*)

Description.—Head and body about 5½ feet long, tail about 2½ feet; weight from 150 to 200 pounds; slender bodied, with small head and long round tail. Color of adult plain brown, often with blackish hairs intersprinkled, giving a pepper-and-salt appearance; darker in middle line of back; ears lined with whitish, outside blackish; underparts whitish, but brown color of sides sometimes encroaching nearly to middle line; legs and feet paler; lower portion of face, upper lip, chin, and upper throat whitish, giving place to brownish on throat; inguinal area broadly and extensively white; tail above brown like back, paler below, with conspicuous black tip. Colors subject to variation. Young paler brown than adult, with large dusky spots on the upper parts and dark bars on the tail.

Identification.—The size, cat-like actions, plain brown color, and long tail characterize the mountain lion. The young may be told from young bobcats by their longer tails and the conspicuous spots on the upper surface of the body; young bobcats are spotted below, but are plain colored, streaked, or inconspicuously spotted above.

Occurrence.—From park boundaries to timber line, perhaps most abundant on the west side.

Habits.—Accounts of this species, variously called mountain lion, panther, cougar, or catamount, have frequently enlarged upon its bloodthirsty characteristics. In some persons this has engendered

an unjustified terror of the animals, for of all the shy creatures of mountain and forest the mountain lion is one of the shyest, and fortunate indeed is the hunter or wayfarer who catches sight of it. Man need have, therefore, no fear whatever of the cougar; but we would not be understood to assert that it is not a bloodthirsty creature for all that. As a killer of deer in a game country and stock in a grazing region it yields the palm to none of its rapacious relatives. Estimates made by the Biological Survey indicate the damage done by each mountain lion in a stock country at $1,000 annually.

The following information regarding the animal was obtained from C. A. Stoner, an old-time hunter, trapper, and timber cruiser of

FIG. 23.—Cougar kitten. Headwaters of Umpqua River, Oreg. This innocent-looking kitten gives no sign that some day it will be a bloodthirsty slayer of deer and livestock. (Photograph from life by William L. and Irene Finley)

Ashford, Wash., who is familiar with the park and much of the surrounding country:

Cougars are as plentiful as ever in western Washington, although they are scarce in some localities. Where deer are abundant they form the cougar's principal food, and one cougar will kill at least one deer a week, often half a dozen. In following cougars with dogs I have often come across one or more carcasses of deer killed by cougars and only partially eaten. Sometimes the kills are slightly covered over with brush. One cougar killed five deer in a hundred-yard circle, all within a week. I know of another cougar that ate a full-grown deer in three days, and on the fourth day killed another. However, I do not think they kill wantonly or merely for sport.

In feeding, cougars always gut a deer first, eating the flesh, bones, and hide, but discarding the hair. They kill the deer by a bite in the neck behind the ears and generally break the neck in the same operation by a sudden twist, but do not strike the animal down with the fore paws, as is sometimes stated. I have examined the stomachs of many cougars killed in western Washington and never found anything but venison, although in some sections they are said to feed occasionally on mountain beaver. I know of only one instance of a cougar killing a mountain goat.

One frequently hears stories of the unearthly scream of the mountain lion. As often described the cry sounds "like the shriek of a woman in distress or the pitiful cry of a lost child." Dr. C. Hart Merriam says: "An attack of indigestion, the cry of a loon, or the screech of an owl, a piece of phosphorescent wood, and a very moderate imagination, are all that are necessary, in the way of material and connections, to build up a thrilling tale of this description." (Mammals of the Adirondacks, 1884, p. 37.) Vernon Bailey (in conversation) says the cry of the animal is a sort of roar and not at all a scream.

In 1897 Doctor Merriam found cougars fairly common in the Nisqually Valley, where they occasionally carried off calves. James McCullough, of Ashford, killed a cougar on Tum Tum Mountain in March, 1895. It was a male, estimated to weigh 175 pounds, and measuring 9 feet from nose to end of tail. In the winter of 1912 a Mr. Montgall, of Ashford, hunting with dogs, killed two cougars near the western boundary of the park. About four years ago in summer J. B. Flett saw a cougar at an altitude of 5,000 or 6,000 feet on the edge of the Nisqually Glacier near Paradise Valley. About a month later the same year park ranger Rosso saw another across the Nisqually Glacier from Paradise.

O. W. Curtis, formerly park ranger at Carbon River entrance, says cougars are commonly found in the vicinity of James Lake, on the north side of the mountain, but are most numerous in the Mowich and Puyallup drainage west of the mountain, where also, deer are said to be most abundant.

Miss Crissie Cameron of the Mountaineers, writes (in letter) that the keeper at Paradise Inn reported a cougar in the vicinity of Reflection Lakes about January 1, 1920.

In view of the game-killing propensities of cougar and their comparative freedom from danger in the park, it may be necessary to reduce their numbers from time to time. Otherwise their depredations on deer may well mean a serious drain on the game resources of the region.

CANADA LYNX

(*Lynx canadensis canadensis*)

Description.—Head and body 2½ to 3 feet; tail about 4 inches; weight from 15 to over 30 pounds; legs long, hair long and thick, tail short, ears tufted, a prominent ruff on neck. In summer grayish-brown, darker on head and back, and shaded into dull whitish below; ears behind, black, with central spot of whitish; spot at corner of mouth, bars on ruff, and entire end of tail black; a few dusky spots show on inside of each limb. In winter the color is much paler and grayer; at all times the tuft of hair on the ears is long and black.

The young are brown above, darkest along middle line, darker and grizzled with gray on head and face; color of upper parts fading out somewhat on sides; below whitish with brown spots.

Identification.—The short tail separates the lynx from all other mammals of similar size, except the bobcat. From this animal it is distinguished by the complete jet black end of the tail, longer tassels on ears, thick legs, broad spreading feet, and larger size. One can

not always distinguish between the tracks and excreta of the Canada lynx and the bobcat; though in general, of course, those of the former are larger.

Occurrence.—Probably for the most part in the Hudsonian Zone, 4,500 to 6,500 feet, occasionally invading the Arctic-Alpine above and the Canadian below.

Habits.—The shy and secretive habits of the members of the cat tribe make their study unusually difficult. At the outset one finds himself practically restricted to an examination of tracks and sign. These indicate the abundance of cats of the genus *Lynx* in suitable locations throughout the park. The Canada lynx is confined to higher portions of the park, the bobcat to lower altitudes. J. B. Flett reports the capture of a Canada lynx some years ago by C. A. Stoner in the Sawtooth Range just south of the park.

Tracks and sign were observed on the glaciers, on trails, in mountain passes, and along the shores of glacial tarns; but they were most in evidence on the backbone ridges at or just above timber line. Sign was seen on the broad back of Burroughs Mountain, 7,100 feet, on August 22. A study of the excreta showed that the animals were feeding principally on different kinds of rodents, including chipmunks, lemming mice, white-footed mice, jumping mice, red-backed mice, large-footed meadow mice, and mountain beavers. Conies also doubtless furnish a juicy morsel on occasion. It is well known that the lynx often feeds on game birds, and is therefore a potential danger to the ptarmigans and grouse within the park.

BOBCAT; WILD CAT

(*Lynx fasciatus fasciatus*)

Description.—Head and body about 2½ feet in length, tail about 5¼ inches; weight up to 20 pounds, rarely more; body slender, legs long, ears with or without tufts of hair, depending on wear and stage of pelage; throat with inconspicuous ruff.

In winter the adults are gray above, with an insprinkling of black and brown hairs imparting a pepper and salt appearance, sometimes spotted. Darker (browner) on head, nape, shoulders, and along middle line of back; sides like back; under parts whitish, with brownish throat and midbelly, and a number of large blackish spots; neck ruff with dark stripes; backs of ears blackish and with grayish bar; legs brown above, spotted or barred with blackish, forelegs whitish below barred with blackish; hind legs brown below, barred with blackish; tail brown above, whitish below, transverse black area above at tip, and suggestions of other transverse bars on upper surface. Skins taken in late spring and in summer are much worn and faded. There is great variation in color.

The young are grayish brown above, middle line darkest, usually with indications of black striping on head, face, legs, and tail, and of broad and irregular dark streaks on middle line of back; backs of ears black with gray spot; beneath whitish with conspicuous blackish spots.

The red cat of western Washington, which may occur on Mount Rainier, has the brown tones of coloration much intensified. It is consequently darker than the bobcat of the Cascades.

Identification.—The bobcat is usually somewhat smaller than the Canada lynx, and is also characterized by its slenderer proportions and shorter ear tassels. The tail lacks the complete black tip and usually possesses transverse black bars, absent in the lynx.

Occurrence.—Probably throughout the park, but more often at the lower levels.

Habits.—J. B. Flett says the bobcat is fairly common in the vicinity of Longmire and Bear Prairie. One was treed near Eagle Peak during January of 1914, and another was taken on Rampart Ridge the same year. James McCullough, of Ashford, caught six during the winter of 1896 in a swamp on the Nisqually River, where the animals had been feeding on ruffed grouse and rabbits.

The food of bobcat and Canada lynx is doubtless much the same. J. Belden Richardson, of the Mountaineers, found remains of squir-

FIG. 24.—Bobcat. Headwaters of Willamette River, Oreg. A beast of intelligent appearance, but an arrant coward. (Photograph from life by William L. and Irene Finley)

rels in bobcat droppings, in addition to the hair and bones of mice, conies, chipmunks, and mountain beaver.

O. W. Curtis, former park ranger at Carbon River, says the bobcat is common at lower levels on the north side of Mount Rainier, seldom going as high as Ipsut Pass (5,000 feet). Sherman Combs, of Lewis, Wash., reports bobcats at Ohanapecosh Hot Springs. James McCullough has often seen cat tracks in the park, especially in winter. In his opinion the bobcat is still as numerous as ever. As with other predatory animals, so with the bobcat, the southwestern portion of the park, including the Tahoma Creek region and Mount Wow, is its center of abundance. Here the bobcat is perhaps the most abundant carnivore. Burgon Mesler, of Ashford, asserts that a man with good dogs can kill a bobcat a day in the region adjoining the Nisqually entrance to the park. A Mr. Montgall, hunting with dogs, in the vicinity of Ashford, is reported to have killed 50 during the winter of 1912.

The bobcat is accustomed to following trails, but does not stick to them so closely as does the coyote, frequently searching out its own course through the woods.

The destructiveness to game of the bobcat has sometimes not been fully appreciated. The Biological Survey of the United States Department of Agriculture has estimated the damage done by this animal in the stock country at $50 a year. C. A. Stoner, of Ashford, Wash., reports that the bobcat kills many deer, especially fawns. He surprised one of the animals in the act of eating a small deer which it had evidently just killed. He has also occasionally found venison in bobcats' stomachs. It is not improbable that the abundance of the animal in and about the park has a direct effect on the number of deer. While extirpation would probably be unwise even if it were possible, there can scarcely be objection to a reduction in the numbers of the bobcat, which has probably increased unduly owing to the protection afforded by the park; though it should be remembered that evidence gathered during the summer of 1919 indicates that mice and other rodents constitute a large, perhaps the chief, part of its food.

WHITE-FOOTED MOUSE; DEER MOUSE

(*Peromyscus maniculatus oreas*)

Description.—Size about that of a house mouse; ears conspicuous; tail long; head and body about 3½ inches, tail about 4½ inches. Ground color of upper parts in unworn pelage cinnamon to russet, slightly paler on anterior half of body; dusky mixture rather strong, but not predominating except in the middle of back, where it shows as a broad irregular blackish patch; eye with well-defined sooty ring around it; a prominent sooty spot at base of whiskers; under parts creamy white; feet white, forearm dusky and tawny, ankles dusky brownish; ears dusky, very narrowly edged with whitish; very little or no white at anterior base of ear; tail blackish brown above, white below. In worn pelage the sides are bright russet to browner; middle of back brown, dusky mixture variously changed to shades of brownish. In adolescent pelage the upper parts are pale cinnamon uniformly mixed with dusky, producing a general effect of brown mixed with fawn.

Identification.—The comparatively large ears and long tail (usually 4½ inches or more) distinguish the white-footed mouse from any of the meadow mice or shrews; and the brownish coloration above and white under parts separate it from the house mouse, which is dirty grayish in color above and below.

Occurrence.—From the park boundaries to the summit of Mount Rainier. Specimens were taken at Indian Henrys (5,300 feet), Longmire (2,700 feet), Bear Prairie (about 2,000 feet), Stevens Creek (3,000 feet), Nickel Creek (3,350 feet), Reflection Lakes (4,900 feet), Ohanapecosh Springs (2,000 feet), Owyhigh Lakes (5,100 feet), White River Park (5,720 feet), James Lake (4,370 feet), Spray Park (5,500 feet), Sunset Park (5,000 feet), St. Andrews Park (5,500 feet), Tahoma Creek (2,500 feet), Rainier Fork Ridge (4,300 feet), Paradise Valley (5,000 feet), Camp Muir (10,000 feet), summit of Mount Rainier (about 14,100 feet), and Mountain Meadows (4,000 feet).

Habits.—The white-footed mouse finds congenial surroundings in almost any habitable situation. It is abundant in the woods, where its runs about on and under huge logs and upturned roots, climbs dead stubs, and inhabits the continuous forests of the lower portions of the park as well as detached clumps of firs and hemlocks near timber line; it is common in meadows and along creeks, where it habitually traverses meadow-mouse trails through the thick grass, uses mossy runways beneath herbaceous vegetation often at the water's edge, crosses the creeks by means of mossy logs, or runs through the lush grass beneath the willow brush; it occurs on burns and dry brushy hillsides, where heather, mountain ash, and huckleberry afford shelter; and it is usually numerous in the rocks, where it is at home in talus slides (usually inhabited also by conies and marmots), and occurs in abundance to 10,000 feet altitude on the long bowlder-covered ridges, leading to the very summit of the mountain. It will be readily apparent that adaptability is one of the animal's most prominent characteristics; and so it is not surprising that it invades and inhabits camps, cabins, or frame buildings often in some numbers. In fact, in abandoned or even occupied cabins one can often reset a number of mouse traps several times during the same night and be sure of a full catch each time.

Unfortunately, the activities of the white-footed mouse in such places are detrimental to supplies. It is unwise to leave provisions or equipment exposed or within reach, for after dark the mouse is bold and active, eating or at least gnawing such divers articles as leather, tallow candles, tobacco, and even dynamite. There is, happily, another side to its character. It is much to be preferred to the house mouse. In fact, a little forethought suffices to make the deer mouse harmless. Where provisions are kept in a tin-lined cupboard and blankets and extra clothing are strung on wires out of reach from the floor there is no difficulty. The worst the mouse can do then is to make a nest in the stove.

At Indian Henrys early in July, while deep snow still lay on the ground, white-footed mice were caught both day and night on trails in the shelter of clumps of alpine firs and mountain hemlocks. Ordinarily, however, the animal is active only at twilight or by night. In winter it does not hibernate. Soft snow prevents it traveling much, but as soon as a crust forms a movement is noticeable. Doubtless some food is stored, as specimens have frequently been taken with their mouths bulging with seeds.

One can not appreciate its full interest and attractiveness until the mouse is kept in captivity. Then its soft dun-brown color, the purity of the white of its under parts, and particularly the large sensitive ears, luminous eyes, and motile vibrissæ elicit admiration. Its demeanor is one of alertness and animation, and it is gentle and seldom offers to bite. The succulent flowers of a species of huckleberry (*Vaccinium deliciosum*) constituted the favorite food of one kept in camp at Reflection Lakes. When thirsty it would drink greedily, apparently lapping up the water like a cat, and seemed perfectly at home in its box.

In this locality the young are born apparently in the first part of the summer, for no females trapped after August 15 showed signs of breeding activity. The nest, if out of doors, may be made of carefully

selected vegetation, but if in a cabin it may be constructed of any material available, bits of paper or cotton from a blanket being often used.

An overnight stay at Camp Muir (10,000 feet) afforded an opportunity for putting out a few mousetraps. Three deer mice were taken in the rock-walled cabin and three outside in the bowlders. Camp Muir is the overnight stop on the route to the summit of Mount Rainier by way of Gibraltar. Timber line (averaging 6,500 feet) is far below. The only vegetation consists of individuals of a few hardy alpine species of herbs and a grass, and, in addition, a lichen on the rocks. The stomachs of the mice taken contained ground vegetal remains, brown or gray in color, sometimes with a perceptible tinge of greenish. J. B. Flett identified the material as derived from the lichen.

On August 8, 1919, a climbing party from Paradise Inn secured a specimen of the white-footed mouse on the summit of Mount Rainier, perhaps the first mammal ever taken in this unusual place. The record is of more than ordinary interest, for the locality is not only more than 14,000 feet above sea level but is between 7,000 and 8,000 feet above timber line.

WESTERN BUSHY-TAILED WOOD RAT; PACK RAT

(Neotoma cinerea occidentalis)

Description.—Head and body about 8½ inches long, tail about 6½ inches; ears prominent, eyes lustrous, tail long and flattish, well haired, almost squirrel-like. Color in fresh pelage brownish buff, much obscured by dusky hairs, which thin out somewhat on the sides, leaving them more buffy; under parts dull white, the hairs lead colored toward their bases, except over chest and inguinal regions; armpits light brown; fore feet white; ankles dark all around; ears brownish, edged with whitish; tail above brownish black mixed with gray, below white with buff band across base. Worn summer specimens average slightly grayer. Old adults are more rusty brown than in fresh fall pelage. The young are darker than the adults.

Identification.—This animal, if clearly seen, will never be taken for anything but a rat; the handsome bushy tail is characteristic and distinctive and readily distinguishes it from the brown rat.

Occurrence.—From park boundaries at least to 10,000 feet altitude. Records of its occurrence or capture relate to Mesler's ranch (2,000 feet), Stevens Creek (3,000 feet), Indian Henrys (5,300 feet), Camp Muir (10,000 feet), and Ohanapecosh Springs (2,000 feet).

Habits.—It is unfortunate that the common name of this interesting woods rodent should carry with it the odium of its relationship to the deadly brown rat; for, as a matter of fact, the wood rat belongs to a different genus. While admittedly rat-like in form, color, and actions, its long furry tail gives it an almost squirrel-like appearance; and an unprejudiced observer will at once concede the grace of its movements and alertness of its demeanor. The large eyes and ears are prominent, and the vibrissæ, which are long and sensitive, constitute a striking feature and are undoubtedly of the greatest service during its nocturnal wanderings.

The wood rat was unusually abundant in the timber along Tahoma Creek; its droppings were seen on the summit of Mount Ruth (8,700 feet); and a large and vigorous male was trapped at Camp Muir (10,000 feet) more than 3,000 feet above timber line, where it was living in the rocks not far from the stone shelter cabin. The stomach of this specimen contained a mass of ground vegetal remains, brownish in color, and containing scattered fibers, identified by J. B. Flett as those of a lichen which grew in rare patches on bowlders in the neighborhood. A fragment of pumice and some slivers of wood were also found in the food mass. At best an inhospitable, bleak, and rocky locality, Camp Muir is one of the last

FIG. 25.—Wood rat. Taken at Ohanapecosh Hot Springs, from specimen posed in natural habitat. (About one-half natural size.) (Photograph by William T. Shaw, State College of Washington)

places in the park where one would expect to find highly organized animals living and thriving.

Camps and cabins are the wood rat's special delight. Here its well-known propensity for carrying away all sorts of articles to its nest is fully exercised; in this and other ways it often becomes an intolerable nuisance to miners, hunters, and campers. Its proximity, during the hours of darkness, is often heralded by a soft tapping with its hind feet on the wood. The variety of articles appropriated and carried off is remarkable.

At our camp on Tahoma Creek wood rats cut our leather shoestrings, ate through the heavy canvas of a trap bag, chewed off the corner of a camera case, cut into a sack of pancake flour, and generally disorganized the cotton supply.

Fortunately the marauders are readily captured, blundering into unbaited traps set close to boxes, walls, or rock banks, where they run. They take a variety of baits, eagerly seeking rolled oats, apple, bacon, or scraps of fresh meat.

MOUNTAIN LEMMING MOUSE; HEATHER VOLE

(*Phenacomys intermedius olympicus*)

Description.—Head and body 4½ to 5 inches long, tail about 1 or 1½ inches long; fur dense and woolly; ears inconspicuous; back grizzled grayish brown, with a yellowish tinge, which is most distinct in spring and summer examples; the fur everywhere sprinkled with blackish hairs; belly dusky whitish; tail bicolor, mixed brown and white above, pure white or dusky-whitish below; under fur dark

FIG. 26.—Mountain lemming mouse. In front of the mouse is the entrance to its underground burrow. The vegetation is huckleberry (*Vaccinium*) and white heather (*Cassiope mertensiana*). Taken at Spray Park from specimen posed in exact habitat. (About two-thirds natural size.) (Photograph by William T. Shaw, State College of Washington)

lead color, irregularly showing through on belly and throat. The young are similar to the adults, but grayer.

Identification.—The size of the lemming mouse, its small ears, dull color, and short tail separate it from all other mammals except the Rainier meadow mouse. Adults of the lemming mouse are slightly larger and more bulky and their hair is woollier than in the Rainier meadow mouse; but some young specimens can not be certainly distinguished in the field.

Occurrence.—In Hudsonian and Arctic-Alpine Zones, usually between altitudes of 4,500 and 8,500 feet. Specimens were taken on Paradise Creek (5,200 feet), Paradise Park (6,500 feet), west slope of Mount Rainier (6,600 and 6,800 feet), Spray Park (5,500 and 6,000 feet), Reflection Lake (4,900 feet), Owyhigh Lakes (5,500 feet), Mountain Meadows (4,000 feet), Sunset Park (5,000 feet), and Clover Lake, White River Park (5,700 feet).

Habits.—The alpine parks and wind-swept slopes of the higher portions of the park constitute the habitat of the mountain lemming mouse. Since the animal does not make or even follow (at all consistently) trails or runways, and besides is totally indifferent to baits used to tempt other small rodents into the naturalist's traps, it is one of the rarer mice in museum collections, and the capture of one is always an event in camp. Judging, however, from the number and distribution of the characteristic winter nests and piles of excreta, the animal is often abundant.

In summer the heather vole is found in the shelter of the heathers (*Phyllodoce empetriformis* and *Cassiope mertensiana*) frequently among the snow patches near the glaciers. It occurs also in log-

FIG. 27.—Winter nest of lemming mouse. St. Andrews Park, located on dry hillside near alpine firs (*Abies lasiocarpa*) and squaw grass (*Xerophyllum tenax*). (Photograph by George G. Cantwell)

tangled grassy burns at a lower elevation, as well as on dry hillslopes in shrubbery made up chiefly of huckleberry, *Lutkea pectinata*, and avalanche lily (*Erythronium montanum*). Occasionally it penetrates the heavily timbered Canadian Zone, for one was secured at Mountain Meadows (4,000 feet) on a mossy rock at the creek margin near a waterfall. At the other extreme it ranges into the Arctic-Alpine Zone, reaching at least 2,000 feet above timber line, several nests being seen on the slopes of Mount Ruth (altitude about 8,500 feet). During the winter the lemmings from the higher slopes probably descend to the border of the open park country, a habitat then shared with the large-footed meadow mouse.

The habits of the lemming mouse are, however, quite different from those of its large rodent relative and the winter work of each

is distinct even when in the same territory. Areas occupied by the large-footed meadow mouse are usually riddled with holes, littered with remains of vegetation, and piled with earthen mounds. The lemming mouse, on the other hand, leaves scarce a trace of its occupation, save for the conspicuous and characteristic under-snow nests.

Most winter nests examined by Shaw were lined with soft shredded blades of snow grass (*Juncus*) and were made snow resistant by well-selected pieces of a branching lichen gathered from among the stones of a moraine. More rarely they were constructed of bear grass or squaw grass (*Xerophyllum tenax*). In many instances there were no surface paths leading to and from the winter nests; in others, however, communicating runways, possibly not those of the heather vole itself, were noted in the vicinity. Fragments from foraging expeditions were inconspicuous, but small stripped twigs of

FIG. 28.—Brood nest of lemming mouse beneath root-bound turf of old moraine, Spray Park. (Photograph by William T. Shaw, State College of Washington)

white heather (*Cassiope*), probably indicative of the winter food of the animal, were occasionally to be seen.

A winter nest studied on Mount Ararat, 5,300 feet, was round, about 4 inches in diameter, and made of dry plant fibers. The inner cavity was lined with finer fibers than those of the outer structure. Between a pint and a quart of feces were found close by and a little downhill from the nest. Apparently the animals abandoned the nest as soon as the snow melted off. Many piles of feces, winter nests, and trails were found in the red heather (*Phyllodoce empetriformis*) on Windy Gap and Chenuis Mountain. One nest about 10 inches in diameter was in a hollow between clumps of heather. The cavity inside was 4 to 5½ inches across. Runways led from it in several directions. Another nest examined contained no less than 4 quarts of compacted grassy material. A summer nest was found at Spray Park August 27. A small round hole well hidden under the heather opened into a burrow which led to a snug underground nest of dead grass and moss fibers. Here, amid warm and dry surround-

ings, the young were found, four in number, and evidently but a few hours old. A number of communicating burrows of small caliber penetrated deep into the recesses of the moss-grown moraines. (Shaw MS.)

The summer food of the lemming mouse is apparently selected for its succulence, and stems of lousewort (*Pedicularis*) were sometimes found at the entrance of its den.

All signs indicate that the heather vole is beset by many dangers. The elements and predatory enemies are ever present. The animal must also cope with disease, and doubtless often succumbs to infections of one sort or another. One individual was found dead on the snow on Pyramid Peak July 12 at an altitude of 6,000 feet. The cause of death could not be ascertained. A malignant infection was noted on the hind leg of another. The lemming evidently constitutes

FIG. 29—Red-backed mouse. At base of western hemlock (*Tsuga heterophyila*). At left is a hole leading to the underground burrow of the animal. Taken at Longmire, from specimen posed in natural habitat. (About one-half natural size.) (Photograph by William T. Shaw, State College of Washington)

a large item in the diet of carnivores at higher levels. On several occasions examination of fecal material, chiefly of lynx and bobcat, revealed jaws and cranial fragments of this mouse.

RED-BACKED MOUSE

(*Evotomys gapperi saturatus*)

Description.—Somewhat larger than a house mouse; head and body about 4 inches long; tail nearly 2 inches long; ears inconspicuous, back with broad band of tawny or reddish brown, sides and under parts grayish white faintly washed with cinnamon buff. The plumbeous hair bases sometimes show through and give a dark appearance.

Identification.—The reddish brown of the back distinguishes the red-backed mouse from the meadow mice; its small ears and short tail separate it from the white-footed mice. This combination of

characters, reddish back and short tail, is found in no other mammal of the park.

Occurrence.—From the park boundaries to timber line. Specimens have been taken at Mesler's ranch (2,000 feet), Paradise Park (about 5,200 feet), Longmire (2,700 feet), Reflection Lakes (4,900 feet), Owyhigh Lakes (5,100 feet), Indian Henrys (5,300 feet), St. Andrews Park (5,500 feet), Sunset Park (5,000 feet), Spray Park (5,500 feet), Glacier Basin (5,935 feet), Ohanapecosh Springs (2,000 feet), Nickel Creek (3,350 feet), James Lake (4,370 feet), and Tahoma Creek (2,500 feet).

Habits.—With its graceful movements and attractive though modest coloration, the red-backed mouse is always an interesting park resident. If one will walk out into the thick timber near Longmire Springs and watch quietly for some minutes he is almost sure to catch sight of one. Maybe a streak and a shadow is all he will see, but often the mouse will proceed with deliberation sufficient to afford an adequate view. Perhaps the animal will run nimbly to the top of a stump and then vanish from sight in a hole; or it may disappear in an old root excavation; or it may run along or under a huge log; or may even climb a spruce or fir, though it rarely gets so far as 15 feet from the ground.

Ordinarily the red-back prefers the root-entangled, moss-protected forest floor in the deepest woods; but individuals are frequently trapped along creek banks, in the tall grass of mountain parks, in thick meadow vegetation such as false hellebore (*Veratrum*), in dry places beneath huckleberry or *Menziesia* brush, or in piles of bark fragments. Considering this variability of habitat, it is not strange that the mouse occurs from the heavily forested country near Longmire to the narrow tongues of firs and hemlocks near timber line. In fact, Doctor Merriam's party, in 1897, found it, next to the large-footed meadow mouse, the most abundant timber-line mammal on the mountain.

It will be remembered that heavy snows often persist on the slopes of Mount Rainier until well into tse summer. This was the case during 1919. At Indian Henrys early in July the groups of black hemlocks and alpine firs looked like dark green islands in a sea of snowy white. Several species of mice were abundant. Not infrequently red-backs were seen traversing the well-traveled runways over the bare ground or running about over the snow from their numerous tunnels beneath the white blanket to the open spaces under the trees. What highways of travel these runways were! Hundreds of furry, bright-eyed creatures, red-back mice, meadow mice, deer mice, and shrews, in summer distributed widely over the broad acres of meadowland, were now concentrated in very narrow limits about the tree clumps; and it is quite likely that, for the time being, they were short of food and foraging space.

The nest of the red-backed mouse is located in an underground burrow, within or beneath a hollow log or stump, on the surface beneath a leafy cover, or even occasionally in a tree at some distance above the ground.

At Indian Henrys a red-backed mouse was seen darting across the trunk of a large alpine fir (*Abies lasiocarpa*). The tree was a

fairly large one, with a rather dense growth of branches reaching almost to the ground. It had been broken off at a point 15 feet up where three prongs, now 6 or 8 inches in diameter, formed a sheltered crotch. On climbing to this point there was found a neat little nest made of lichen. Later the proprietor itself was found at home. No doubt, this location afforded a much dryer nesting site than could have been found on the ground at this season of melting snows. (Shaw MS.)

On September 7, 1919, in Sunset Park a dunnage bag containing clothes and miscellaneous articles was stowed beneath a thick conifer to keep off the wet. Two days later a mother red-backed mouse was found within. A little one clung to her breast, and another had but just released its hold. On further investigation two more young were found. The mother had evidently regarded the dunnage bag as an exceptionally dry log with a wonderfully cosy interior and had given birth to her four young there.

The young may be born at any time during the season, which on Mount Rainier extends at least from the middle of July through September. The smallest number of young in 10 lots examined was 3, the largest 6, the average being slightly over 4.

The red-backed mouse is not so agile as certain others of its family, and one is sometimes able to catch it with the bare hands. Unlike the white-footed mouse and the wood rat, the red-backed mouse does not make a nuisance of itself about cabins, though occasionally an individual is trapped about the buildings at Longmire. It does not hibernate.

OREGON MEADOW MOUSE

(*Microtus oregoni oregoni*)

Description.—Size small, somewhat larger than a house mouse, but tail shorter, head and body about 4 inches, tail about 1⅝ inches in length, fur short, ears inconspicuous; upper parts dark brown, almost blackish; under parts, dusky, lightly washed with dull buff, or the whole surface whitish; tail blackish, a trifle lighter below; ears blackish, scantily haired, protruding through the fur.

Identification.—The size of the Oregon meadow mouse and the combination of dark coloration and short tail distinguish it from other mammals except the lemming mouse. From immature specimens of the latter it is difficult to distinguish in the field. The Oregon meadow mouse is smaller than the lemming mouse and its fur is shorter and less fluffy. In hand the deep internal reentrant angles of the lower molars in the lemming mouse distinguish it from the Oregon meadow mouse. The latter is distinguished from the closely related Rainier meadow mouse by darker brown color and slightly smaller size.

Occurrence.—At lower levels southwesterly in the park, below 4,000 feet. Specimens were taken at Mesler's ranch (about 2,000 feet), and Longmire (2,700 feet).

Habits.—Usually found in drier places than those in which one would ordinarly look for meadow mice.

RAINIER MEADOW MOUSE

(*Microtus oregoni cantwelli*)[5]

Description.—Similar to the Oregon meadow mouse, but very slightly larger (head and body about 4¼ inches, tail not quite 1¾ inches) and tending to be paler brown.

Identification.—See the paragraph on "Identification" under the Oregon meadow mouse (p. 70).

Occurrence.—On alpine meadows and parks in the Hudsonian Zone, usually at or above 5,000 feet. Specimens were taken at Sunset Park, (5,000 feet), Glacier Basin (5,935 feet), and Reflection Lakes (4,900 feet).

FIG. 30.—Rainier meadow mouse, found in fairly dry localities amid abundant vegetation. From left to right in picture the plants are the Cusick speedwell (*Veronica cusickii*), Sitka valerian (*Valeriana sitchensis*), and snow grass (*Juncoides* sp.). Taken at Glacier Basin from specimen posed in natural habitat. (About one half natural size.) (Photograph by William T. Shaw, State College of Washington)

Habits.—Close attention to the heather tracts, which are generously distributed as banks or cushions of vegetation in favorable places above 5,000 feet, will usually disclose a network of runways or trails. Here is mystery. What tiny travelers in the heather world follow these passages? A partial answer, at least, was given by the capture of one of these mice on such a highway at Sunset Park. But there remain innumerable questions as to the home and home life, food, and general activities of the inconspicuous creature, the answers to which must be given by some observant mountaineer of the future.

At Glacier Basin the Rainier meadow mouse was found living amid the abundant vegetation of sunny hill slopes.

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[5] Named in honor of George Gordon Cantwell, of Los Angeles, Calif., a well-known field collector of birds and mammals in the Northwest and formerly a reservation inspector and field assitant of the Biological Survey, United States Department of Agriculture.

ROCKY MOUNTAIN MEADOW MOUSE

(*Microtus mordax mordax*)

Description.—Head and body about 4¾ inches, tail comparatively long (about 3 inches); ears and feet small. In summer color of back grayish bister, sides grayish, belly whitish, feet lead-colored, tail dimly bicolor, dusky above, soiled whitish below. The winter pelage is lighter than in summer; dorsal stripe of yellowish bister more sharply contrasted with the deeper gray of sides and face; belly heavily washed with pure white; tail sharply bicolor; feet whitish. The young are darker and less sharply marked than the adults; feet and tail dusky.

Identification.—The moderate size and inconspicuous ears and coloration place this mammal as a meadow mouse. From the large-footed meadow mouse it is distinguished by smaller size, while the grayish color and longer tail separate it from the Rainier meadow mouse. From the Olympic meadow mouse it is separated by smaller size, shorter hind foot, and grayer color.

Occurrence.—Sparingly on the east side of the park. The only specimen taken was secured at Glacier Basin (5,935 feet).

Habits.—This meadow mouse is apparently of rare occurrence on Mount Rainier. Ordinarily it is found in dryer places than those preferred by the large-footed meadow mouse. The animal is not a trail maker, but forages widely through the grass and other vegetation of the meadows.

OLYMPIC MEADOW MOUSE

(*Microtus mordax macrurus*)

Description.—Similar to Rocky Mountain meadow mouse, but larger and darker; head and body about 5¼ inches, tail about 3½ inches. In summer the upper parts are dark brown, shaded with numerous black hairs, sometimes sooty gray; sides slightly paler; under parts washed with dull buff or whitish; feet lead color; tail distinctly bicolor, blackish or brownish above, soiled whitish below, usually white tipped. The young are darker than the adults, with blackish feet and tail.

Identification.—The inconspicuous ears, dull color, and relatively short legs and tail identify this animal as a meadow mouse. It is considerably larger than the Oregon or Rainier meadow mice and is darker and has longer hind foot and tail than the Rocky mountain meadow mouse. From adults of the large-footed meadow mouse it is distinguished by smaller size; it is often difficult (or impossible in the field) to separate from young examples of the large-footed, but usually can be told by its narrower feet, stiffer hair, and smaller incisor teeth. As a rule, of course, the Olympic and large-footed meadow mice do not occur in the same localities. Their ranges do overlap, however, in a limited area on the west side of the mountain.

Occurrence.—In Transition and lower Canadian Zones below 3,000 feet altitude, rarely higher. There are five record stations within or close to the park: Longmire (2,700 feet); Bear Prairie (about 2,000 feet), 3 miles south of Longmire; Stevens Creek (3,000 feet);

Sunset Park (5,000 feet); and Mesler's ranch, 1 mile west of park boundary (between 1,800 and 2,000 feet).

Habits.—West of the Cascade Mountains the Olympic meadow mouse replaces the closely related Rocky Mountain meadow mouse, which is common east of the divide. The habits of the Olympic meadow mouse are not known to differ materially from those of the Rocky Mountain meadow mouse. All taken by our party were secured in rather dry grassy situations. Later J. B. Flett trapped one in his woodshed at Longmire. While true hibernation among meadow mice is unknown, the animals evidently become inactive or else much restricted in their activities in winter.

FIG. 31.—Large-footed meadow mouse on stream margin near burrow entrance. Taken at Owyhigh Lakes from specimen posed in natural habitat. (About one-half natural size.) (Photograph by William T. Shaw, State College of Washington)

LARGE-FOOTED MEADOW MOUSE; WATER RAT; WATER VOLE

(*Microtus richardsoni arvicoloides*)

Description.—About three-fourths the size of a brown rat; head and body about 6 inches long; tail a little more than 3 inches; similar to the other meadow mice but decidedly larger. In summer the upper parts are dark brown, sprinkled with coarse black hairs; belly with light wash of pearl gray or silvery whitish; feet gray; tail blackish above, soiled white below. The winter pelage is darker than summer, with an excess of black hairs above; belly strongly whitish. The young resemble the adults but are slightly darker, with long, woolly fur and dark gray feet and tail; at one stage of pelage the under parts are entirely dusky.

Identification.—A shy, bluish gray or dark appearing creature, usually about one-half or three-quarters as large as a full-grown brown rat, with no bright colors or conspicuous markings. If the animals are in hand their large hind feet distinguish adults from any other meadow mice found in the park.

Occurrence.—Usually in the moist park country from 4,000 feet to timber line (6,500 feet); but specimens have been taken from 1,800 feet altitude, on the Nisqually River near Ashford, to 10,000 feet, at Camp Muir. Other points of capture include Paradise Park (5,200 to 6,500 feet), Longmire (2,700 feet), Indian Henrys (5,300 feet), Spray Park (5,500 feet), Reflection Lakes (4,900 feet), Owyhigh Lakes (5,100 feet), James Lake (4,370 feet), Stevens Creek (3,000 feet), Mountain Meadows (4,000 feet), Sunset Park (5,000 feet), St. Andrews Park (5,500 feet), Glacier Basin (5,935 feet), and Bear Prairie (about 2,000 feet).

Habits.—At first glance one would see little or nothing in this inconspicuous dark-gray meadow mouse to attract more than passing attention; on further acquaintance, however, it turns out to be one of the most interesting animals on Mount Rainier.

First, it is the largest of the North American meadow mice; second, it is a burrowing animal, active, at least at intervals, under the heavy snows of winter; and, third, it ranges widely and evidently possesses wonderful powers of acclimatization or perhaps migration, making itself at home in damp meadows in the alpine parks, altitude 5,000 feet, and ranging onto the bleak and wind-swept rock cleavers above timber line, at least to a height of 10,000 feet.

C. Hart Merriam (MS.) writes:

> The heather beds, meadows, and gardens of the timber-line region together constitute the kingdom of the great alpine water vole, the most abundant timber-line mammal of Mount Rainier, whose burrows and runways are never out of sight. Recently exposed ground from which the snow has just melted is brown and perforated in all directions by thousands of holes of this vole. They form an endless system of inosculating tunnels and passages, and their occupants are often seen even in broad daylight. Side passages are often seen containing large quantities of their dung pellets. This indicates a cleanliness of habit in striking contrast to the less sanitary habits of the rock cony (*Ochotona*). The adults are so large and strong that a steel trap is necessary to catch them.

Evidently considerable digging of new tunnels is done in winter, probably for purposes of finding food. The dirt is excavated and forced out under the snow, forming a long and snake-like plug of earth, resembling that made by the pocket gopher under similar circumstances. When the snow melts this earth plug dries in the sun and often persists for the greater part of the summer.

At Reflection Lakes (4,900 feet) the workings were observed in turf which held water-like sphagnum, on open brushy hillsides, and even on high ridges. Most of the animals were actually caught, however, in situations which indicated the meadow mouse to be at least semiaquatic.

Not infrequently mounds of earth, recently excavated by the water rat, were seen. These are rounded piles of dirt, much resembling the mounds of pocket gopher and mole. Water-rat mounds can usually be told from those of the mole by the fact that, in the water-rat mounds one can usually see where the last load of earth was

pushed out, which is not the case with those of the mole. Furthermore, the water rat leaves some of its burrows open, which distinguishes this species from those of the pocket gopher, for the latter almost invariably keeps its burrows closed.

In the fall large numbers of the animals move out from the meadow country to the drier hillsides, which doubtless at this time afford more abundant food. As the snow gradually melts in spring they return to the moister meadowlands, establishing themselves in underground burrows and seldom appearing above ground. During the period of melting snow, however, when their winter quarters are being uncovered, they are frequently observed running from one snow tunnel to another or even foraging in a leisurely manner

FIG. 32.—Mounds of earth excavated by large-footed meadow mouse. St. Andrews Park. Mouse in trap in foreground. (Photograph by George G. Cantwell)

among the tender newgrown plants. The summer burrows radiate over the surface of the ground to their feeding places and to near-by logs, stumps, or sheltering brush. Apparently free use is made of the old burrows of other mammals such as moles, conies, chipmunks, and pocket gophers. Several of the water rats were caught in mole runways apparently occupied by their rightful owners at the time. Water rats are natural trail makers. When living in the heather on the hillsides they do some cutting to facilitate their passage, perhaps for food also. In addition to cutting the brush out of their trails, they frequently tunnel through earthy obstacles. At intervals along the runways are noted pellets of water-rat excreta, identifiable by their comparatively large size. Sheltered places be-

neath overhanging creek banks are a favorite resort. Numerous tiny footprints appear on the soft mud and abundant cuttings of different kinds of green vegetation are conspicuous. Burrow openings and along-stream passageways, as well as mossy landing places, are also observable. The animals are much at home in the water, where they swim and dive with facility. Many kinds of plants, depending principally on their accessibility and availability, are used for food. These include the avalanche lily, deertongue or dogtooth violet (*Erythronium*, two species), of which the bulbs and leaf stems are eaten; the wild parsnip (*Ligusticum purpureum*), the valerian (*Valeriana sitchensis*), mountain dock (*Polygonum bistortoides*), coltsfoot (*Petasites frigida*), red heather (*Phyllodoce empetriformis*), cinquefoil (*Potentilla flabellifolia*), aster (*Aster*, sp.), grass, wild clover, conifer seeds, and at least two kinds of blueberry (*Vaccinium* sp.). In winter the bear grass or squaw grass (*Xerophyllum tenax*) is a favorite food. The caretakers at Paradise Inn assert that these rodents do considerable damage by destroying apples and cabbages in storage.

The first week in July at Indian Henrys, with 4 feet of snow on the ground, the animals were occasionally noted during the middle of the day, sitting about the entrances of their snow tunnels like little rabbits, showing little fear of the intruder. With care one could approach to within a few feet of them. Later in the summer they were much shyer and almost never seen in a quiet pose. At Reflection Lakes one was watched beneath a mountain ash bush for nearly two minutes. It moved about quickly, stopping at short intervals and blinking in the sunlight. The animal gives one an impression of dumpiness or sluggishness (one was caught by Shaw in his hands), though usually it runs like other meadow mice or red-backed mice, making a fairly rapid nonstop run until safe within its burrow.

The melting snow of spring reveals large nests constructed on the surface of the ground. "Warmth from the body of the animal causes a large cavity to form about the nest and this is first to be revealed by the vanishing snowdrifts melting away from these bulky subsnow nests. The young are born in warm dry nests of shredded grass blades a few inches below the surface of the ground even though the ground be covered by a considerable depth of snow. Such a nest found at Indian Henrys on July 12, 1919, contained a family of fully formed and active young about one-sixth the size of adult specimens." Winter nests studied by Dr. C. Hart Merriam in 1897 were of large size and made of sedges and white heather piled against the rocks. The young number from four to six and it is not improbable that despite the shortness of the season in the alpine park region on the mountain (three months or less) more than one litter is raised.

In addition to its daytime activities, the large-footed meadow mouse is one of the most industrious of night workers, as was conclusively demonstrated one evening at St. Andrews Park. Our camp bed having been made on a thick cushion of heather, we retired as usual, when shortly we noticed a crunching or scratching sound, apparently immediately beneath our heads. Then we heard similar sounds under the foot of the bed. This amused and interested us for

a short time, but presently it became somewhat monotonous. Repeated kicks, accompanied finally by vocal imprecations, did not avail to silence the energetic workers. We had placed our bed over a network of meadow-mouse runways; and apparently the animals were busy, night and day, in cutting the blueberry brush (*Vaccinium deliciosum*) and other accessible vegetation. Fortunately, they confined their activities strictly to the native plants and did not touch any of our camp equipment.

Although Doctor Merriam saw meadow mice of this species up to 8,500 feet altitude in Paradise Park in 1897, we were scarcely prepared for the capture of a specimen in a trap set near the wall of the rock cabin at Camp Muir (10,000 feet altitude). The pumice ridge on which the cabin is located is of bleak and forbidding aspect.

FIG. 33.—Rock-shelter cabin at Camp Muir (10,000 feet). A large-footed meadow mouse was trapped under the rock wall of the cabin. (Photograph by Walter P. Taylor, Biological Survey)

At intervals it is smitten by furious boreal tempests. On one side appears the crevasse-seamed face of Cowlitz Glacier, on the other the snowy expanse of Paradise and Nisqually Glaciers. In full view are the rough route over Cowlitz Cleaver, the formidable walls and precipices of Little Tahoma, Cathedral Rocks, and Gibralter, and the rounded dome of the summit of Mount Rainier itself. Timber line is 3,000 feet below. Vegetation, at first glance, seems to be lacking entirely, but careful search reveals a few hardy species of plants, such as a lichen on the rocks, and *Smelowskia ovalis*, *Poa suksdorfii*, and *Draba aureola*, on the restricted areas of pumice slope between the banks of snow and ice. The meadow mouse had eaten some green material as well as some yarnlike fibers.

MUSKRAT

(*Fiber zibethicus osoyoosensis*)

Description.—Length of head and body about 12⅜ inches; tail 10⅝ inches; form robust, legs short, feet large, modified for swimming; feet and toes fringed by short stiff hairs, and toes of hind feet partly webbed; tail long, compressed laterally, covered by small scales and thinly haired; external ear small; fur dense and waterproof. In fresh pelage the upper parts are glossy dark brown varying toward blackish; sides russet; under parts usually heavily colored with cinnamon and dark russet or brown hairs, throat and ventral region lighter; hips black. In worn pelage the upper parts are dull sooty brown, sides and under parts paler, usually with a few rusty overlying hairs. The young are seal brown, paler beneath.

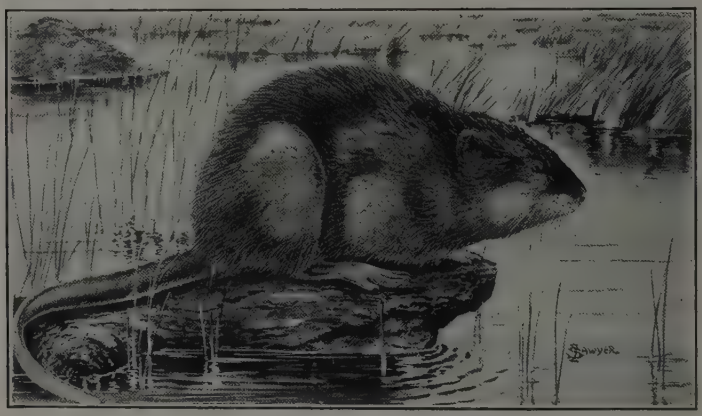

FIG. 34.—Muskrat. From Biological Survey

Identification.—The aquatic habits of the muskrat, its size, and its long scaly tail, compressed laterally, permit its immediate identification.

Occurrence.—In lower portions of the park; apparently now trapped out within its boundaries.

Habits.—The muskrat, because of its abundance and its attractive winter coat, is one of the most valuable fur-bearing mammals in America. At Funsten Bros.' fur sales in St. Louis September, 1919, one lot of 400 extra long dark spring pelts solds for $5.10 per skin, making a total of $2,040 for one lot. With such high prices as then prevailed, it is not strange that the haunts of the muskrat on the Nisqually River, within the boundaries of the park and just outside, should know it no more. Although in agricultural sections it may do some damage by burrowing through ditch banks and destroying grain and vegetables, in most localities it is harmless. The animal lives in a burrow in the banks or in a "house" made by heaping up aquatic vegetation. Three litters, each containing from 3 to 12

animals, are born annually. (Hollister, N. Amer. Fauna No. 32, 1911, pp. 9–10.)

BROWN RAT; NORWAY RAT

(*Rattus norvegicus*)

Description.—Size large; length of head and body 8½ to 10 inches, tail 7½ to 9 inches; form robust; tail never as long as head and body; ear short, extending barely or not to eye when laid forward. Upper parts a coarse, variable mixture of dull brownish and slaty grayish,

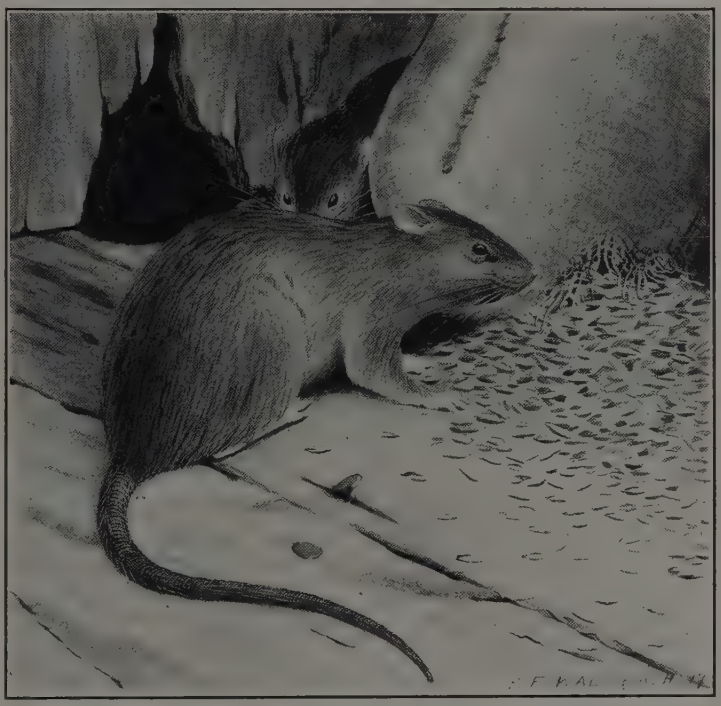

FIG. 35.—Brown or Norway rat. One of the most destructive animal pests in the world. (Photograph from drawing by E. R. Kalmbach, Biological Survey)

the back darker than the sides; occasionally with tinge of russet in middle line or on posterior half of back; under parts grayish white, usually with an inconspicuous wash of cream-buff; tail obscurely bicolor, the hairs blackish above, whitish below, the skin everywhere distinctly appearing at surface.

Identification.—The only animal in the park with which the brown rat might be confused is the western bushy-tailed wood rat. The coarser, harsher fur of the brown rat and its sparsely haired round tail serve to distinguish it from the soft-pelaged bushy-tailed species.

Occurrence.—Here included on the authority of J. B. Flett, who has observed it at Longmire.

Habits.—As Dr. E. W. Nelson has pointed out, rats * * * "destroy annually hundreds of millions of dollars' worth of foodstuffs and other property, and through the distribution of bubonic plague and other diseases cause the deaths of untold numbers of human beings." (National Geographic Magazine, vol. 32, 1917, p. 1.) Quoting further from Nelson's paper: "It [the rat] is a sturdy, fierce, and cunning animal with extraordinary fecundity. These characteristics have enabled it quickly to overrun and occupy new territory despite the never-ceasing warfare waged against it by man and the competition of other mammals."

The rat is reported by J. B. Flett to have been common six years ago in some of the older buildings at Longmire Springs. A three-year campaign with traps has, fortunately, entirely eliminated it. Continuous attention will doubtless have to be given to keeping it out. If the pest ever should become abundant it is certain to do much damage to stores of provisions, horse feed, camp equipment, and supplies of all sorts.

HOUSE MOUSE

(*Mus musculus musculus*)

Description.—Size small, head and body about 3½ inches, tail about 3½ inches; form slender, with no special peculiarities. Upper parts wood brown, somewhat darker along back; underparts like sides or a little more yellowish but with no obvious line of demarkation; bases of hairs everywhere slate-gray; tail dull brownish throughout, occasionally lighter below than above.

Identification.—The only mammal with which the house mouse is likely to be confused is the white-footed mouse, which has larger and more prominent ears, white under parts, and bicolored tail.

Occurrence.—At Longmire; at present scarce, perhaps extirpated.

Habits.—J. B. Flett, who resided at Longmire Springs continuously for some years, states that six years ago house mice were quite abundant in the old Longmire house. Both mice and rats are supposed to have been brought in with horse feed. For three years they have been systematically trapped, and now the rats have been eliminated and the mice are very scarce. During the winter of 1919–20 Flett caught 111 mice in a cabin at Longmire, mostly white-footed mice, with scattered red-backed mice and meadow mice, but no house mice appeared. The nefarious habits of this ubiquitous pest are too well known to call for comment.

"Although occasionally straying to considerable distances from houses, *Mus musculus* is characteristically an urban species, and its spread from central Asia to Europe and thence throughout the world has been chiefly due to human agency." (Miller, Catalogue of the Mammals of Western Europe, 1912, p. 869).

RAINIER POCKET GOPHER

(*Thomomys douglasii shawi*[5])

Description.—Size somewhat smaller than the brown rat; head and body of males about 6 inches in length; tail about 2½ inches; fe-

[5] See Taylor, Proc. Biol. Soc. Washington, vol. 34, p. 121, 1921.

males somewhat smaller; fore claws very long; external fur-lined cheek pouches; body robust; legs short; eyes and ears small and inconspicuous; hair short and smooth; tail short. Color in summer coat light brown above, the lead-colored hair bases showing through to a slight extent; paling somewhat on sides; nose usually darker, but occasionally with an irregular whitish spot; under parts whitish, the lead-colored hair bases showing through; a light wash of brownish present; throat whitish; tail thinly haired, whitish above and below.

Identification.—The stocky build of the pocket gopher, his short, powerful legs, stout, exposed incisors, and outside cheek pouches present a combination found in no other animal.

Occurrence.—Found on the east side of the mountain in the Hudsonian Zone, above 4,500 feet, between Cowlitz Divide on the south

FIG. 36.—Rainier pocket gopher, Owyhigh Lakes. On mound of earth it has excavated. Note the small eyes and ears, the indications of the external cheek pouches (below and at either side of mouth), and the powerful forefeet and claws. (About two-fifths natural size.) (Photograph from specimen posed in natural habitat by William T. Shaw, State College of Washington)

and Grand Park on the north. Specimens secured at Glacier Basin (5,935 feet), and Owyhigh Lakes (5,100 feet).

Habits.—The pocket gopher is well equipped for its subterranean existence. Its sharp incisor teeth serve both as picks with which to make excavations and as chisels for obtaining food; its large fore feet, armed with sharp claws of remarkable length, also assist in digging; its tiny ears and eyes, while sufficient for the ordinary requirements of seeing and hearing, are not so large as to be in the way in its narrow quarters; its long whiskers and sensitive tail are highly developed as organs of touch. But, most remarkable of all are the large external cheek pouches, which give the animal its name and which are used as bags for carrying food to its storage chambers.

The pocket gopher lives almost altogether below ground, excavating an elaborate series of ramifying burrows usually within 5 or 10 inches of the surface. The nest is made of clean dry grass and

located deep in dry soil. The subsurface runways are mainly for the purpose of obtaining food, which consists largely of roots and other plant parts. Food material not intended for immediate use is cut in lengths of about 1 inch and carried in the cheek pouches to enlarged chambers so near the surface as to be in the moist ground. The presence of a gopher den is indicated by mounds of earth which are conspicuous wherever the animals are active. In course of its excavations the gopher does not carry earth in the cheek pouches but pushes and shoves it out of the hole with nose and fore feet. When the animal has done digging it leaves the opening of its burrow securely closed with an earthen plug. This habit is made use of in trapping the gopher, for if the hole is opened the animal, in the course of an hour or so, will return to plug it. (Shaw MS.)

The pocket gopher is active throughout the winter. Earth excavated at this time is firmly packed in tunnels through the snow on the surface of the ground. Melting of the snow reveals serpentine ridges of earth, virtually the casts of the gopher's under-snow tunnels.

When first observed at Owyhigh Lakes on July 8 a little fresh work was in evidence and many of the tunnel entrances were left open. Later these holes were being closed here and there and fresh mounds began to dot the landscape. Probably during the winter, while protected by the snow, the gophers did not take the precaution of closing the burrow entrances; but the arrival of spring and the removal of the snow cover, accompanied by exposure to danger from rapacious animals, made essential this measure of protection.

The gophers at this locality were living on the grassy hillsides and open meadows, being seldom or never found in the near-by forest. The colony adjacent to our camp at Owyhigh Lakes was estimated to contain at least 200 animals.

NORTHWESTERN JUMPING MOUSE

(*Zapus trinotatus trinotatus*)

Description.—Size a little larger than a house mouse; head and body about 4 inches, tail nearly 6 inches long; legs slender, ears moderate; back with broad band of blackish grizzled with ochraceous-buff; sides brown (ochraceous-buff) with a sprinkling of blackish hairs; ears inconspicuous; under parts pure white; tail bicolor, above gray (drab), below white. The hind legs are much longer than those in front, and the animal is well adapted for jumping.

Identification.—The yellowish color of the sides and pure white under parts, the long hind legs, short fore legs, and the long tail distinguished the jumping mouse from any other park mammal. Its habit of progressing by jumping will perhaps be more useful in identifying it than any other attribute.

Occurrence.—Irregularly from the park boundaries to 6,000 feet altitude. Specimens were taken at Stevens Creek (3,000 feet), Reflection Lakes (4,900 feet), Paradise Park, Longmire (2,700 feet), Glacier Basin (5,935 feet), Mountain Meadows (4,000 feet), Ohanapecosh Springs (2,000 feet), Owyhigh Lakes (5,100 to 5,350 feet), and Nickel Creek (3,350 feet).

Habits.—Few mountain mammals are more graceful than the jumping mouse. Its attractive rusty-yellow color, long hind legs,

and unusually long tail immediately attract attention. The jumping mouse prefers to live in the shelter of the thick grass of the open meadow, but is sometimes found in mats of red heather, in huckleberry brush, mountain ash, or Sitka valerian.

Cantwell observes that the jumping mouse progresses by a series of kangaroo-like jumps, clearing the tops of the tall grass and shrubbery, and covering from 3 to 6 feet with each leap. Its first move when disturbed is a long jump into the grass, where it waits, rabbit-like, to see what is going to happen. If further pressed it makes off in good earnest. When at the height of the jump the animal turns its head down, arches its back, and, with fore feet extended, dives into the thicket like a frog into the water. Although it may strike the thick brush on the descent, it is not upset, but lands squarely on its feet. Striking first on its fore feet, it quickly tucks it long hind

FIG. 37.—Jumping mouse, Owyhigh Lakes. In front of the animal is its summer nest, placed on the ground among plants of Sitka valerian (*Valeriana sitchensis*), snow grass (*Juncoides* sp.), and mountain dock (*Polygonum bistortoides*). The nest is covered with dead leaves of *Juncoides*. (About two-fifths natural size.) (Photograph from specimen posed in exact habitat by William T. Shaw, State College of Washington)

legs beneath the body and well forward, and is off again. Short jumps in the open are made in an upright position by using the hind legs alone and steadying itself by bracing back on the long strong tail. Several kept under observation in a cage moved about, while feeding, on all four legs like other mice, but were rather awkward in handling their long hind legs on short turns or quick moves.

The jumping mouse rarely ventures forth of its own accord during the daylight hours. Occasionally, however, one's attention is attracted by the disturbance of the vegetation as some animal beneath the foliage leaps away. Careful search where the motion ceases usually discloses the jumping mouse, and if one examines the place from which the animal came its shelter nest may be discovered.

All summer nests found by our party were on the ground, in form spherical or dome-shaped, exceedingly fragile and usually composed of dry sedge grass. In size they were about 3½ inches high and 4 to

6 inches in diameter. A single opening was provided on the side of the nest. All were in the subalpine parks between 4,900 and 6,000 feet, the actual sites including tangles of snow-prone huckleberry bushes, flower-covered meadows, the weeds and flowers of a warm side hill, and mats of heather. During the summer of 1897 Dr. A. K. Fisher found a nest in sphagnum moss near a willow clump at Longmire Springs. The nest was spherical and measured about 6 inches in diameter. The outer portion was composed of sphagnum and the lining of a broad grass or sedge cut in 1-inch lengths. Each nest appears to be the retreat of a single individual. At Reflection Lakes repeated attempts were made to capture a jumping mouse in the nest, but the animal was always sufficiently alert to make its escape.

Early in the fall the jumping mouse becomes exceedingly fat, evidently in preparation for winter hibernation. If unearthed during the quiescent period it is found rolled up in a little furry ball, to all appearances quite dead, but, given warmth, the latent spark of life in its body soon responds and in half an hour it is fully awake. If exposed to a low temperature it dozes off again.

Jumping mice were active at Indian Henrys early in July, while yet considerable snow lay on the ground. It does not cut trails or runways through the vegetation, as do so many of the mice. When available, however, runways are frequently utilized.

On Mount Rainier the young appear to be born in midsummer. Data at hand are insufficient to set definite limits to the breeding season or to give the average number of young. On August 10, 1897, Vernon Bailey dug out a family of five, two adults and three young, at O. D. Allen's residence, 3 miles west of the Nisqually gateway of the park. One female trapped at Owyhigh Lakes on August 10, 1919, would soon have given birth to seven young.

RAINIER MOUNTAIN BEAVER; APLODONTIA

(*Aplodontia rufa rainieri*)

Description.—Size about that of a muskrat; head and body about 13½ inches, tail about 1¼ inches; body stout; eyes and ears small; tail so short as to be concealed in the fur. Upper parts light brown grizzled with blackish, the blackish tending to be concentrated on the middle line of the back; under parts drab brown, sometimes marked with irregular white patches, and with a sparse insprinkling of blackish hairs; a faint wash of pinkish buff in some examples.

Identification.—The mountain beaver may be distinguished from a young marmot or from the muskrat by the apparent absence of a tail. It is unlikely to be confused with any other species.

Occurrence.—From park boundaries to 6,000 feet. Specimens were taken at Paradise Creek (5,200 feet), Longmire (2,700 feet), Reflection Lakes (4,900 feet), and Ohanapecosh Springs (2,000 feet).

Habits.—The mountain beaver, belonging to an ancient family of rodents now confined to the Pacific coast of North America, is abundant about Mount Rainier. In spite of its name, the animal is not a beaver, nor does it always live in the mountains.

Its large burrows perforate the ground in many places, on open bushy slopes, under dense clumps of alders and willows, in the open, or in the dark woods among the roots of trees and stumps. The

burrows are usually connected by well-beaten runways, and where a considerable colony is located form an irregular network of large dimensions. In many instances the burrows run close to the surface, and frequently the roof falls in, leaving exposed a long narrow trough. Freshly excavated earth is not often seen, but when active digging is begun the mountain beaver does a great deal of work. In one instance between Lewis and Bear Prairie a cubic yard or more of earth had been removed, the material including stones 6 or 8 inches in diameter.

The mountain beaver is often found on springy hillsides or in moist soil along creek banks. After the snow has melted many of the hillside burrows dry out somewhat. Frequently, however, the burrows

FIG. 38.—Mountain beaver, Reflection Lakes. Note the small eye and ear. (Photograph from life by William L. and Irene Finley)

are so situated that water from some spring or creek runs through them.

The mountain beaver is a sluggish animal, apparently slow of wit and of blundering temper. A half-grown animal and an adult were taken alive at Reflection Lakes. The young one, on being liberated, found a rill of water and followed its course for a short distance. It seemed to like the water, but only slopped about in it, making no attempt to swim or get beneath the surface. At intervals it stopped to perform a careful toilet, shaking off the excess water, then giving itself a sort of rub down, deliberately going over its body from head to foot with its fore paws. Its mouth and hind feet were also brought into play in the process. Encountering some leaves of deer-tongue, it began eating, sitting on its haunches and using its fore feet like a squirrel to hold the succulent leaves. Its sense of sight was poor, for it paid no attention to articles held suddenly before its face; but its touch and hearing were extremely sensitive.

The gentlest impact on its long whiskers made a tremor run through its frame, and unusual sounds also had a marked effect on the animal. In running the creature loped along rather awkwardly, reminding one of a little pig. While most active at night, the animals are sometimes trapped or seen in the daytime.

A mountain-beaver slide was found at Longmire. This was simply a steep runway about 5 feet long, down which the animals had traveled until it was worn smooth. Perhaps, like the otter slide, this is used for play.

A great variety of succulent vegetation is used for food. In fact, the availability of different plants largely determines whether or not they are eaten. The mountain beavers of the park are es-

FIG. 39.—Young mountain beaver, Reflection Lakes. Eating leaves of deer-tongue (*Erythronium*). (Photograph from life by William L. and Irene Finley)

pecially fond of Sitka valerian (*Valeriana sitchensis*), lungwort (*Mertensia lævigata*), huckleberry (*Vaccinium* sp.), lupine (*Lupinus* sp.), false hellebore (*Veratrum viride*), western bracken (*Pteridium aquilinum pubescens*), and skunk cabbage (*Lysichiton camtschatcense*).

About August 1 the animals begin harvesting operations, cutting off numerous sprays of vegetation and disposing them in neat piles to dry on rocks, logs, or stumps about the entrances of their burrows. Each bundle of vegetation is usually composed of plants of one species, doubtless because the different sprays happened to be cut and carried in at the same time. Often one end of a log near a burrow entrance will be quite covered by the plants in process of curing, and frequently the horizontal lower branches of near-by willows or other brush will also receive loads of "hay." In one

place an Alaska cedar had fallen and broken so that the highest part of the log was about 5 feet from the ground. This was evidently a favorite drying place and was almost completely covered with plants. Dr. C. Hart Merriam observed that the irregularly broken stump of a hollow tree had every available point covered to a height of 6 or 7 feet, a handful here and handful there, never a large quantity in one place. After drying for a few days, the cured vegetation is carried into the burrow, doubtless for use as winter food and probably nest lining as well. Withes of alder cut off 6 to 8 feet above the ground have been noted near its den, indicating that it can climb bushes or low trees.

The mountain beaver remains active all winter. Occasionally the melting snow discloses a ridge of earth several feet long, in diameter about that of an Aplodontia burrow, a ridge which clearly shows that the animal was actively excavating during the winter season and had to push the earth excavated into a tunnel under the snow. J. B. Flett (in letter) gives details of finding tunnels through the hard snow and ice in the ravine below Comet Falls (4,200 feet) on November 24, 1919. These tunnels ramified to different burrows. The snow had been about 4 feet deep, but had thawed until it was only 2 feet, disclosing the tunnels. One was 11 feet long and went up to a talus slope of large bowlders, which would afford ideal foraging conditions when the snow lay deep. Mrs. McMahan, wife of the caretaker at National Park Inn, Longmire, saw a mountain beaver in the open on the Rampart Trail in midwinter (January 23, 1920).

Coyotes are probably the principal enemies of the mountain beaver in the park. Doubtless other carnivorous mammals prey upon the Aplodontia whenever they can.

In certain instances the mountain beaver does considerable damage by undermining government trails, making difficult their maintenance in good condition. Dr. C. Hart Merriam found where a large burrow ran under an alpine fir that several square feet of root bark had been removed. When all is said, however, damage is done in isolated cases only and in the aggregate is not large.

CASCADE HOARY MARMOT; WHISTLER; WOODCHUCK; GROUNDHOG

(*Marmota caligata cascadensis*)

Description.—Size about that of a badger; head and body about 20 inches in length; tail about 9 inches; body thick set and clumsy in appearance (individuals weigh from 9 to more than 20 pounds); head short and broad; legs short and stout; tail rather short, densely haired, and slightly flattened; nose broad and blunt; ears short, broad, rounded, and well haired; eyes small. Adults have face black; nape, shoulders, and upper back gray, remaining portion of back and rump black grizzled with gray; tail brown; underparts dark brown, grizzled with gray; feet black. Specimens taken in midsummer are in poor pelage, with the rump and tail a burnt brown. The young are darker and softer haired than the adults.

Identification.—The size, gray shoulders contrasting with darker back, daytime habit, shrill whistle, and bearlike actions permit the easy identification of the marmot.

Occurrence.—Abundant in rock slides, sometimes on meadows, from 4,900 feet, rarely below, to timber line and occasionally nearly to 10,000 feet. Most abundant on the northeast side of the mountain at Glacier Basin. Specimens taken also at Paradise Park (timber line), Paradise Creek (5,600 feet), Indian Henrys (5,300 feet), and Sunset Park (5,000 feet).

Habits.—The Cascade hoary marmot is one of the largest rodents in North America. It is principally, if not exclusively, diurnal, and excavates large burrows, sometimes on grassy meadows, more often among the bowlders of a rock slide. The burrows may be single or in colonies connected by well-beaten paths. Dr. C. Hart Merriam writes that occasionally runways are found extending from the rock slides several hundred feet to favorite feeding grounds, and it is of

FIG. 40.—Cascade hoary marmot, Reflection Lakes. (About one-eighth natural size.) (Photograph from life by William T. Shaw, State College of Washington)

interest to note that these marmot runways serve as highways for several other mammals also, such as chipmunks, conies, meadow mice, and white-footed mice.

The masses of slide rock resulting from the effect of frost and ice on the cliffs furnish the marmot's best protection. When away from his stony shelter the animal appears nervous, but on regaining the rocks his anxiety largely disappears. He is accustomed to remain in one position for several minutes. Usually this is a ruglike attitude on a flat rock. Sampson writes that in many cases the surface of the marmots' lookout rock has become quite polished from its use by many succeeding generations of watchers, and suggests that St. Simeon Stylites himself was hardly more constant. (Sierra Club Bulletin, vol. 6, 1908, p. 37.) Occasionally the marmot assumes the posture of the recumbent lion of the conventional gateway. If startled he often sits up on his haunches, diving out of sight, if close

to his burrow, on the near approach of danger. If thoroughly alarmed he does not reappear for hours.

His senses are keen, though his sight is obviously not so good as his hearing and smell. If his attention has not been attracted one may stand at close range in plain view and the marmot is never the wiser. Once his attention is caught, however, he watches one closely. Dr. M. W. Lyon, jr., says marmots could usually be called out of their dens by whistling shrilly. (Smithson. Misc. Coll., vol. 50, 1907, p. 89.)

The marmot's food consists exclusively of green vegetation. Grasses, composite flowers (*Arnica* and *Agoseris*), green leaves, and blue lupines have been found in stomachs examined. Cantwell observes that the animal seldom stops to eat on his foraging expeditions, but carries mouthfuls of green stuff back into his den, where it is consumed in safety. Early morning and late afternoon are favorite times for feeding. No evidence of storage of vegetation for winter use has been obtained.

A marmot observed on Success Cleaver (6,600 feet) came loping over the snow from the rocks, stopping at intervals to look cautiously around. Each time he started he raised his conspicuous tail in a sort of "flicker." Having traversed the snow between his home ledge and a limited tract of bare ground at the top of a cliff, he began eating grass, having first walked to the brow of the cliff and made a careful survey of his surroundings. He lay prone on the ground, lazily pulling his body over the vegetation like a prairie dog, stopping at short intervals to raise his head and look about him.

The heavy fat body of the marmot does not give the impression of alertness or agility, but he possesses a generous endowment of both. An observer on the summit of Mount Wow heard rocks tumbling down an almost perpendicular chute and saw a marmot nonchalantly traversing a slide which looked too steep for any quadruped to cross in safety. The gait of the marmot has been compared with that of a bear, a pig, a dog, and a fisher. Dr. C. Hart Merriam watched one old male, which, as he stood swinging his big head and neck from side to side on his perch on a high rock, reminded him of an old bull fur seal on his harem on the Pribilof Islands.

Several individuals seen were apparently troubled with ectoparasites, scratching and biting themselves as if the skin itched, assuming a mouse-like posture, round like a ball, as they did so.

If one invades an amphitheater-like cirque inhabited by marmots, his appearance is immediately proclaimed to all the wilderness people by a clear and penetrating whistle, a sound possessing a distinctly musical quality, and under favorable conditions carrying for more than a mile. Often one individual apparently assumes the rôle of watchman or guardian, locating himself on some high rock and giving the alarm on the approach of anything of a suspicious nature. The whistle is really a squeal made in the throat, the lips, of course, taking no direct part in the sound production. Ordinarily a single note is given, but one heard on Burroughs Mountain whistled five times in rapid succession; one at Success Cleaver whistled at intervals of three or four seconds; and one observed in

Paradise Valley by Dr. C. Hart Merriam in 1897 repeated the whistled note one hundred times a minute, loud and clear, at first, but after the animal had kept it up without any rest or interval for a half hour it decreased somewhat in strength and frequency, falling to 94, 92, and finally 90 a minute. It seemed to be an inspiratory whistle, and his sides drew in with every note. It appeared to be very fatiguing.

Probably many wild creatures in the marmots' habitat take note of the penetrating whistle of this guardian of mountain fastnesses. One day two eagles sailed through the pass leading from the headwaters of the Puyallup River to those of St. Andrews Creek. Instantly all the marmots in St. Andrews gave the alarm. A mountain goat standing motionless on the almost sheer face of the rocks,

FIG. 41.—Young marmots on sunning rock, Reflection Lakes. Two of a litter of three found on this rock slide. They resemble the adults in markings. (Photograph from life by William T. Shaw, State College of Washington)

perhaps taking this as a warning, resumed his cliff-side journey and soon was lost to view. (Shaw MS.)

The young are two to four in number and are born in early summer. At Indian Henrys on July 12 four young, no larger than pine squirrels, were seen about a den surrounded by snow, taking their first look at the world. Old females taken by Dr. C. Hart Merriam's party August 2 to 5, 1897, had finished nursing. Four young were noted in Paradise Creek Valley on August 7 of that year. Immatures observed at Glacier Basin toward the end of August, 1919, were well grown. The comical gravity with which the young stare at the passer-by is highly amusing.

A mother marmot, under observation at Reflection Lakes, was somewhat anxious regarding her young whenever humans approached the rock slide. One morning the old marmot was on a big flat rock sunning herself, when one of the little ones climbed up

beside her. She was decidedly uneasy, first pushing him over by putting her nose under one of his front legs, then picking him up in her mouth, like a cat picks up a kitten, except she had him by the side of the body. As she lifted him he curled up like a ball. She carried him 10 or 12 feet over the rocks and into a crevice. The old marmot was apparently just weaning her family, for occasionally she carried mouthfuls of grass to her den in the rocks. (Finley, Mazama, vol. 5, 1919, pp. 324–325.)

Among enemies of the marmot probably the coyote and timber wolf are most important. The black bear may also take toll of their numbers, and the golden eagle is much feared. Slight attention is paid to hawks, however, even when the young are about.

The heavy snows come early in the fall and remain until summer on Mount Rainier, and the marmot enters on his period of hibernation about October 15 and does not reappear before the middle of June. Thus two-thirds of his life is spent in the winter sleep. J. B. Flett says those at higher altitudes hibernate longer than those lower down; and, in his opinion, depth of snow and weather conditions in general have much to do with the length of their hibernation period. When the marmot comes out from hibernation he is said to be spare and lean.

The flesh of the marmot, when taken young and properly prepared, is very edible. But old individuals are tough, and the meat possesses a gamey taste which some dislike.

COOPER CHIPMUNK[6]

(*Eutamias townsendii cooperi*)

Description.—Head and body about $5\frac{1}{4}$ inches, sometimes more; tail about 4 inches; body slender; tail long and well haired, somewhat flattened; ears pointed; eyes prominent; general color deep brown, the nine lengthwise back stripes less accentuated than in the little chipmunk, tending to be obscured by the deeper color; light stripes brownish or grayish, never white; under parts white, tail black above, margined with silvery gray; dark brown below, edged with black and gray. The white of the throat and the brown and lighter stripes of the back conspicuous, especially in the fall pelage. When the animal sits quiet on a branch its color often has a marked disruptive, and so a concealing, effect.

Identification.—The nine lengthwise stripes on the back separate the chipmunks from any other mammals in the park; the slightly larger size, darker coloration, and the silver gray rather than brown margins of the tail distinguish this species from the little chipmunk.

Occurrence.—From the park boundaries to 6,000 feet or nearly to the limit of trees. Specimens taken at Mesler's ranch (2,000 feet), Reflection Lakes (4,900 feet), Tahoma Creek (2,500 feet), Paradise Park (5,000 to 5,400 feet), Longmire (2,700 feet), Indian Henrys (5,300 feet), St. Andrews Park (5,500 feet), Spray Park (5,500 feet), Sunset Park (5,000 feet), Crater Lake (4,900 feet), Lake James

[6] Named in honor of Dr. James Graham Cooper, a pioneer naturalist of the Pacific coast. Doctor Cooper was born June 19, 1830, in New York City, and died July 19, 1902, at Hayward, Calif. From 1853 to 1855 he worked principally in Washington State. He collected the cotypes of the Cooper chipmunk in "Klickitat Pass," between Mount St. Helens and Mount Adams, during July, 1854.

(4,370 feet), Mountain Meadows (4,000 feet), Glacier Basin (5,935 feet), Bear Prairie (about 2,000 feet), White River (3,100 feet), Owyhigh Lakes (5,350 feet), and Ohanapecosh Springs (2,000 feet).

Habits.—The chipmunks are deservedly the most popular mammals in the park. While somewhat less sprightly and vivacious than his smaller relative (the Olympic chipmunk) the Cooper chipmunk is just as interesting. He can be easily tamed and about occupied buildings may become quite a pet. If one leaves the door of a cabin open, presently in will come a chipmunk, fearless and companionable. Discovering a few grains of rolled oats on the floor, one can almost see him beam with satisfaction, and he at once sits down on his haunches and, holding a grain in his fore paws, eats it like a little

FIG. 42.—Cooper chipmunk, Glacier Basin. This species is slightly larger and darker than the little chipmunk, and usually ranges at a lower altitude. From specimen mounted in natural habitat. (Slightly over one-half natural size.) (Photograph by William T. Shaw, State College of Washington)

pie. At Paradise Inn he scampers about the porch among the guests and even invades the kitchen, where several are regularly fed. J. B. Flett says one chipmunk remains inside the hotel during the winter. One night the caretaker put him out, but found him begging by the door in the morning, so relented and let him in again.

The deep timber of the Canadian Zone is the center of abundance of the Cooper chipmunk, but he is found well into the scattered clumps of alpine trees in the Hudsonian Zone. Rarely individuals are found living in the sunshine, but the shade of the dense forest is more acceptable. Some appear to have taken up residence in and about alders along the streams.

This chipmunk regularly traverses the enormous fallen logs and stubs in the thick woods and is often seen in service-berry and blueberry bushes harvesting the luscious fruit. On rare occasions he

ascends trees to a considerable height. The exuberance engendered by the clearing weather following a two weeks' storm in Sunset Park so animated one Cooper chipmunk that he ran up a dead stub to a height of 50 feet, apparently just for the fun of it, for he came right down again; and chipmunks were seen on every hand, climbing about in the huckleberry bushes. Besides wild berries, he feeds on seeds of many kinds, hazelnuts, roots, buds, bulbs, and fungi.

About 7 o'clock one morning a Cooper chipmunk near National Park Inn, Longmire, was followed for 15 minutes for the purpose of gaining an insight into his activity at this time of day. First noted on a rock, he remained there watching the observer for some moments. Then he changed position slightly, accenting his movements with tail jerks, but uttering no sound. Suddenly he left the rock and entering a brush pile gamboled about with another chipmunk. Then, without any good reason, so far as could be seen, he ran up a Douglas fir for 6 feet and then down again. Next he scampered through the woods for a couple of rods to the site of a camper's picnic supper, and there, a moment later, he was surprised in the act of clearing the débris off a pie plate beneath the sheet-iron top of an open camp fireplace. Startled, he carried the fragment of pie crust 8 feet up a Douglas fir, eating the tidbit in safety on a cross branch. When he had finished, he ran down the trunk, clinging by means of his sharp claws, the hind feet being reversed in the process. The old pie plate proved irresistible, however, and in a moment the chipmunk was back. Emerging through the stovepipe hole in the sheet-iron stove top, he sat comfortably on his haunches on a rock, holding the piece of pie crust in his fore paws and taking tiny bites all around it, his jaws moving very rapidly. On finishing he dived into the fireplace once more and presently reappeared through the stovepipe hole, eating the pie crust as before.

The call notes of the Cooper chipmunk are lower pitched and more deliberate of utterance than those of the little chipmunk. The sudden appearance of a strange object, however, always stimulates his loquacity, and with a *chuck chuck*, *whit whit whit*, or *whoop whoop* he beats a hasty retreat to safety. The greater his excitement the faster come the call notes. Another common call note is a thrushlike whistle, *whoit*, which apparently indicates mild curiosity.

At Sunset Park the observer made a squeaking sound with the lips to see what birds and mammals were about. A parent chipmunk and her young one, the latter well grown (the date was September 7), ran up a stub to investigate. The mother disapproved of her young hopeful's actions, and twice chased it off the stub, but the irrepressible youngster wanted to see, too, and when its parent perched on the tip of the stub it took a place on a flat fir branch which commanded a good view of the surroundings.

Chipmunks, as is well known, live in shallow burrows usually beneath bowlders and logs. According to J. B. Flett, they disappear about the 1st of November. The first individual to reappear in 1920 was seen at Longmire on February 16. It is said that they sometimes come out from hibernation while still there is much snow on the ground.

At Owyhigh Lakes a live Cooper chipmunk was brought into camp and put in a box for safe-keeping. The next morning he was found

curled up in the form of a sphere, respiration very slow, body stiff and cold. On placing him where he would warm up slowly he partially came out of his torpor, his respiration increasing in speed and his circulation being somewhat restored. During the awakening process his whiskers vibrated and he trembled all over. Cold weather probably automatically puts the chipmunk to sleep.

The coyote, bobcat, hawks, and other carnivorous species must take heavy toll of these abundant animals.

LITTLE CHIPMUNK; OLYMPIC CHIPMUNK; MOUNTAIN CHIPMUNK; ALPINE CHIPMUNK

(Eutamias amoenus caurinus)

Description.—Length of head and body about 4¾ inches; tail about 4 inches. General color pale grayish brown, with nine stripes

FIG. 43.—Little chipmunk, Owyhigh Lakes. More sprightly and vivacious than the Cooper chipmunk, the little chipmunk prefers open spaces to dense forest, and is usually found at higher altitudes than his larger cousin. From specimen mounted in natural habitat. (Photograph by William T. Shaw, State College of Washington)

lengthwise on the back, alternating dark brown and lighter; sides brownish; underparts whitish; face gray, striped with dark brown; tail blackish above, margined with brownish, or sometimes tending toward grayish, below pale brownish edged with black and brown.

Identification.—The nine stripes lengthwise on the back distinguish the chipmunks from all other park mammals. The slightly smaller size, paler color, and brown rather than silver gray margins of the tail separate this species from the Cooper chipmunk.

Occurrence.—In open situations usually in the Hudsonian Zone, between 4,500 and 6,500 feet; rarely to Longmire Springs and the summit of Mount Rainier. Specimens have been taken at Paradise Park (5,400 feet to 6,400 feet), Reflection Lakes (4,900 feet), Indian Henrys (5,300 feet), St. Andrews Park (5,500 feet), Sunset Park

(5,000 feet), Spray Park (5,500 feet), Glacier Basin (5,935 feet), Owyhigh Lakes (5,350 feet), Muddy Fork of Cowlitz River (about 3,000 feet), ridge between St. Andrews Park and South Puyallup River (6,000 feet), south slope Mount Rainier (8,000 feet), west slope of Mount Rainier (6,600 feet to 6,800 feet).

Habits.—The little chipmunk is especially fond of the bright and sunny open country of the subalpine parks. He is more active than the Cooper chipmunk, besides being of a more nervous temperament. His voice is higher pitched and his call notes uttered more rapidly. While the two species overlap in altitudinal range, the little chipmunk ranges higher than the Cooper.

The nest is placed in an underground den, the entrance to which is usually inconspicuous. Excavated earth is seldom seen. One chip-

FIG. 44.—Little chipmunk demonstrating a fondness for nuts, Mazama Ridge. (Photograph from life by William L. and Irene Finley)

munk seen at White River Park jumped across a small creek and dodged into a bank burrow of the large-footed meadow mouse (*Microtus richardsoni arvicoloides*). The little chipmunk is always a conspicuous denizen of the talus slopes, in which also the cony and marmot occur; and he not infrequently utilizes meadow-mouse trails through the heather mats.

While the Cooper chipmunk remains for the most part on or near the ground, the little chipmunk is often seen in the lower branches of firs and hemlocks, and not infrequently climbs trees to a height of 50 feet.

Huckleberries, wild currants, and many other varieties of berries and seeds are eaten. Civilized fare, such as oats dropped about where the pack horses are fed, is especially relished. Grain, nuts, and dried fruit are special delicacies. Cantwell noted that the chipmunk when

engaged in feeding on the ground often crawls about slowly on his belly, running off, when alarmed, with tail held at right angles to the back.

At all times sprightly and vivacious, the little chipmunk is no less industrious than he is playful. His Latinized Greek cognomen, *Eutamias*, means "typical steward," and so he is. On August 7 a number of little chipmunks were seen gathering lungwort (*Mertensia laevigata*) seeds on a dry rocky slope at Glacier Basin. The small black seed of this plant is axially placed on the lower stems of the raceme. By standing on his hind feet the chipmunk could reach some of the stems. Others had to be jumped for, and occasionally the chipmunk had to climb the stouter ones, riding them to the ground. The seeds of stalks refusing to bend in this manner were

FIG. 45.—Persistence is a pronounced trait of the little chipmunk. This individual could be lifted from the ground as he tried to dig out the meat from a nut tied on the end of a string. (Photograph from life by William L. and Irene Finley)

harvested in midair, the chipmunk clinging by the hind feet, head down, gleaning with dextrous hands, while the cheek pouches bulged more and more.

The animals were very abundant in a series of burns between Grand Park and the West Fork of White River. On hearing a squeaking sound, four excited chipmunks in as many directions chittered a response and climbed four different stubs to points of vantage. Often a strange object is contemplated silently for some moments, the expressive tail slowly wigwagging. Frequently a pair would be seen apparently playing a game of follow the leader.

The intelligence of the chipmunk is shown by observations made at the Mazama Club camp, summer of 1919. William L. Finley has described the various occurrences as follows:

We had no sooner pitched our tent on Mazama Ridge than a little chipmunk ran up the tree where I was standing and sat looking down curiously

as if to inquire what we had come for. He watched me as I nailed up an old box against the tree for a cupboard. As soon as we had stacked in our provisions he called in all the neighbors, and they began gnawing open and carrying off whatever was available. Fortunately we discovered the raid made on the nuts in our dunnage bags before they were all gone. We decided after that they would work for any nuts they got.

I tied a string to a peanut, and soon Chippy was running along after it as a cat tries to catch a spool. At first he would sit and open up the nut and store the kernels away in his cheeks. After a nut was pulled away from him a few times his first idea was to cut the string and carry the whole thing away.

Chippy was ambitious to get a nut, no matter where it was. He soon learned to walk ropes and a slack wire as easily as he could go from branch to branch. I next hung some nuts on a long string attached to the slack wire. They were within a few inches of the ground. I thought perhaps he would climb down the string to get the nuts. He tried to reach them from the ground, but finding it impossible Chippy ascended the tree and walked the slack wire. When he came to the long string with the nut dangling at the end he did the simplest

FIG. 46.—Little chipmunk and the camera, Mazama Ridge. He is apparently making a detailed examination. Curiosity and inquisitiveness are among the marked characteristics of the species. (Photograph from life by William L. and Irene Finley)

thing possible, hauled the string up hand over hand to get the nut. He soon learned that nuts grew on strings, and he went around camp hauling up every string that he came to. (Mazama, vol. 5, 1919, pp. 325–326.)

The young are out and active during the first week in August. At this time Dr. C. Hart Merriam in 1897 found half and two-thirds grown animals much more plentiful than the adults on the south slope of Mount Rainier.

Prominent among the call notes of the little chipmunk is a *whtz! whtz! whtz!* often kept up for a quarter of an hour or more. When suddenly surprised the chipmunk breaks into a whole series of excited chitterings. It possesses a thrushlike whistle, *whoit*, much like one of the calls of the Cooper chipmunk.

Probably all the predaceous birds and mammals active in daylight are foes of the little chipmunk. The squeals of a live weasel, kept in camp for photographic purposes, always caused much excitement among the chipmunk population in the vicinity.

The winter is spent in hibernation. Specimens taken the last of September were fat. During October the chipmunk becomes less and less active, and when the cold weather comes on, usually about November 1, they hole up. J. B. Flett notes that on February 14, 1920, there being little snow on the ground at Longmire, a little chipmunk appeared, being followed two days later by a Cooper chipmunk. With the return of cold weather about a week later both disappeared, and neither was seen until March 31, when the little chipmunk appeared in midst of the worst snowstorm of the season. Flett says the chipmunk ate until his little cheeks were puffed out. He then went back to sleep and came out the third time on April 13.

The altitudinal range of the little chipmunk is unusual among mammals. He is occasionally seen at Longmire (2,700 feet), and was observed also at the Muddy Fork of the Cowlitz River (3,300 feet). On a trip to Camp Muir chipmunks were seen at timber line (6,800 feet). In 1897 on the south side of the mountain Dr. C. Hart Merriam noted a little chipmunk at 8,000 feet, completely surrounded by ice and snow. Mr. and Mrs. William L. Finley and a party of Mazamas saw a little chipmunk on August 15, 1919, on the very summit of Mount Rainier, at an altitude of over 14,000 feet, more than 7,000 feet above timber line.

MANTLED GROUND SQUIRREL; GOLDEN-MANTLED GROUND SQUIRREL; BIG CHIPMUNK; ROCK SQUIRREL

(*Callospermophilus lateralis saturatus*)

Description.—Size of a brown rat; length of head and body about 8 inches; tail about 4½ inches; body somewhat corpulent; ears pointed; eyes round and prominent; tail well haired and somewhat flattened; back grayish brown, with two series of three more or less conspicuous lengthwise stripes on each side of the back, an almost obsolete black stripe above, a white stripe in the middle, and a strong black stripe below; underparts lighter; head, shoulders, and forearms inclined to be tawny.

Identification.—The size and the plump, less graceful proportions of this squirrel, together with the smaller number of stripes lengthwise, separate this animal from the chipmunks. The presence of stripes distinguishes it from the tree squirrel.

Occurrence.—Principally in the Hudsonian Zone, between 4,500 and 6,500 feet. Most abundant on the east side of the mountain, becoming less numerous westerly. Specimens have been taken at Paradise Park, Rainier Fork Ridge (4,300 feet), Indian Henrys (5,300 feet), Spray Park (5,500 feet), Glacier Basin (5,935 feet), Owyhigh Lakes (5,100 feet), St. Andrews Park (5,500 feet), and west slope of Mount Rainier (6,600 feet to 7,300 feet).

Habits.—The mantled ground squirrel is fond of the open country and does not occur in thick timber. It occurs principally in the Hudsonian Zone, though individuals were seen in the Canadian Zone at Longmire (2,700 feet) and the Arctic-Alpine Zone on the summit of Burroughs Mountain (7,200 feet). It lives in holes beneath bowlders, logs, stumps, or rock slides. The dens are shallow, and the squirrel doubtless occasionally utilizes the abandoned burrows

of marmots. Burns, littered with logs and brush, are favorite places of resort.

In physiognomy and personality it is intermediate between the ground squirrels (*Citellus*) and chipmunks (*Eutamias*). Like the chipmunks, it is exclusively diurnal, but, unlike them, it inclines somewhat to corpulency and is of a phlegmatic disposition. As with many other small mammals, the dust wallow is popular. One was seen scratching in a sandy place. Presently it turned a lateral somersault and pushed itself through the dust, jumping up and scampering off at once as though the momentary dust bath had given it enormous satisfaction. When startled it sometimes assumes a picket-pin attitude.

FIG. 47.—Mantled ground squirrel, Mount Rainier. Often called the "big chipmunk." (Photograph by William L. and Irene Finley)

The food of the mantled ground squirrel consists largely of roots, bulbs, and seeds. Mushrooms are also eaten. Provisions in considerable variety, such as grain, flour, rolled oats, dried fruit, bacon, and even dried macaroni, are relished. It pulls over the long stalks of tall grasses and other plants to obtain access to the seeds, storing them temporarily in its capacious inside cheek pouches, which sometimes become enormously distended. In foraging through the grass it occasionally raises its head to look about. Frequently it sits on its haunches, chipmunk-like, handling food with its fore paws. One individual chased off a Clark crow which had evidently approached closer than the squirrel thought proper to a desirable tidbit.

Cantwell says its note is a sharp clear whistle, generally used as an alarm signal; and that when closely pressed and in imminent danger it sets up a frightened chatter which at once impresses one

with its distress. Stanley G. Jewett heard a peculiar squirrel note, given under stress of excitement, described as a rattle something like the call of a Leucosticte, ending in three sharper notes, like the alarm whistle of the female Tolmie warbler *preet! preet! preet!* Individuals of a family encountered at Yakima Park were chirping strongly back and forth to one another, one individual being observed on a stump and the others in the lower branches of some alpine firs, none, however, more than 6 feet above the ground.

Where abundant the mantled ground squirrel does not hesitate to enter old cabins or frame buildings, where it becomes a nuisance, pilfering provisions, digging into paper bags, and committing other depredations. Several lunches set to one side at the Mountaineers' camp in Summerland were said to have been completely carried away by this squirrel. The squirrel's boldness is not, however, wholly disadvantageous; for it permits the passing traveler to become acquainted. With some individuals it is possible to get on very good terms, so that they will even eat from one's fingers.

DOUGLAS SQUIRREL; PINE SQUIRREL

(Sciurus douglasii douglasii)[7]

Description.—Size about that of a brown rat; length of head and body about 7¼ inches; tail about 5 inches; body stout but moderately slender; ears pointed, prominent, of decidedly alert appearance; eyes round and lustrous; toes long and claws sharp; tail well haired, as in squirrels generally, somewhat flattish; dark grayish brown above, the color separated as a rule from the paler or redder color of the under parts by a black line; in some a broad lengthwise band of lighter brown in the middle of the back; ears with small tufts; a brown ring about eye; under parts varying from pale buffy brownish to intense reddish brown; tail grayish or tawny brown sprinkled and margined with blackish; edged with silver grayish or brownish.

Identification.—The unstriped dark-brown back distinguishes this squirrel from any other member of the family in the park.

Occurrence.—From the park boundaries to timber line and above, all around the mountain. Collected at Mesler's ranch (2,000 feet), Longmire (2,700 feet), James Lake (4,370 feet), Tahoma Creek (2,500 feet), Reflection Lakes (4,900 feet), St. Andrews Park (5,500 feet), Ohanapecosh Springs (2,000 feet), Sunset Park (5,000 feet), Cataract Creek (4,500 feet), Fryingpan Creek (3,700 feet), Glacier Basin (5,935 feet), Owyhigh Lakes (5,100 feet), Muddy Fork of Cowlitz River (3,000 feet), and Mountain Meadows (4,000 feet).

Habits.—A bundle of restless energy, the Douglas squirrel is always one of the most interesting mammals of the woods. His bright eyes, unusual activity, graceful movements, and saucy manners are sure to attract comment. On seeing one suddenly, he appears to be almost overcome by his nervous excitement, and, running jerkily up the nearest tree, he seems to call down imprecations upon the observer for disturbing the quiet of his peaceful woods. There are times when he seeks a convenient horizontal branch or knot close to the tree trunk

[7] David Douglas (1798–1834), an eminent Scottish botanist. Employed by the London Horticultural Society as a botanical collector, he made valuable contributions to knowledge of plants and animals, particularly in British Columbia, Washington, Oregon, and California.

and settles down, ball-like, with fluffy tail arched over back, quietly to await developments. More often he greets the intruder with a surprised *qurrreep.*' or *skeeeeh.*' and retreats rapidly up the tree. Fixing his gaze on the malefactor, the squirrel scolds roundly *keeooo.*' *keeooo.*' or *quooo.*' *quooo.*' or *skeeeooo.*' *skeeeooo.*' or *killoo.*' *killoo.*' John Muir, writing with reference to the Douglas squirrel of the Sierra Nevada, says: "A Kings River Indian told me that they call him 'Phillilooeet,' which, rapidly pronounced with the first syllable heavily accented, is not unlike the lusty exclamation he utters on his way up a tree when excited." (Mountains of California, 1894, p. 228.) Sometimes the syllables are pronounced rapidly as if in nervous haste, at others more slowly. Often with each *keeooo* the

Fig. 48.—Douglas squirrel, at James Lake. A fearless and expert climber. From specimen posed in natural habitat. (Photograph by William T. Shaw, State College of Washington)

squirrel jumps nimbly a short distance on the perpendicular bark of the tree, with head and body down, or sidewise, or pointed up the tree. If he does not actually move when the call is given a tremor runs through his frame and he shakes his tail. If he deems it expedient to seek shelter he climbs to a height of 50 feet or more or until he is well concealed by the thick vegetation. He is then likely to relapse into silence. The most remarkable of his utterances is the trill or lilt call, which often announces his presence while still the traveler is at some distance. His long, slim fingers and sharp claws afford him wonderfully sure footing, though once a Douglas squirrel was seen pursuing a Cooper chipmunk on a perpendicular trunk in such nervous haste that the squirrel nearly fell.

The Douglas squirrel is of an inquisitive temperament. When awaking in the morning twilight in the woods one frequently sees

him on the trunk of a near-by tree, bracing himself, ears erect and manner alert, his bright eyes eagerly engaged in an inspection of one's sleeping appointments.

Frequently when one is traveling a trail with a pack train a squirrel will run out from some quiet sheltered nook to cross the trail. Coming suddenly on the unexpected cavalcade, he frequently startles the horses, and is himself frightened nearly into a somersault, often presenting a very funny appearance.

In our experience the Douglas squirrel is hard to tame. An individual captured and placed in a box was very ill-tempered, indeed quite violent, possibly due to an injured leg. He would jump aggressively at a hand or any object put in the box, seeming to possess an almost weasel-like energy and vindictiveness. Water he drank greedily, not putting his nose in but lapping it up. Under natural conditions the squirrel, while not averse to life in the vicinity of camps, is much shyer and less approachable than the chipmunks.

Because he does not hibernate, the Douglas squirrel is a harvester of foodstuffs. He is expert in cutting off the seed cones of Douglas fir, lovely fir, and related conifers, allowing them to fall to the ground below, to be gathered later. He then hides them in cavities beneath or within logs, in the ground, in hollow stumps, or elsewhere until desired for use. The cones, falling at intervals in the quiet woods, are often a source of mystery until one discovers who is responsible. As John Muir says, one may easily know this little workman by his chips. Piles of cone scales near some convenient log or stump indicate the sites of squirrel banquets. The quantity of cone scales shows that the same dining table is used repeatedly.

The extraordinary activity and energy of the squirrel is shown by an observation made at Longmire by J. B. Flett. Here, in the fall of 1920, one squirrel cut 1,167 Douglas fir cones in three days, and in addition to these carried many under the house. The animal began work at the first light of day. Mr. Flett gathered and stored two boxes of cones under the house for the later use of the squirrel, but the animal found a small opening and proceeded to steal them.

One squirrel was seen in the brush 5 feet above the ground gathering hazelnuts (*Corylus*). Another in foraging about had evidently run into a cobweb, portions of which still adhered to his face. He appeared to be trying to look dignified through his cobweb mask, and the result was comical in the extreme.

The nest is located in hollow trees or in the branches outside, according to conditions. The Douglas squirrel becomes quiescent during the severest storms, though he is more or less active throughout the winter. He possesses marked adaptability to temperature and surrounding conditions. He was seen not only throughout the forest but also at Camp Curtis (August 6) playing about in the rocks (9,000 feet), 2,500 feet above timber line, probably 2½ miles from the nearest trees. Later one squirrel was seen and another heard at Steamboat Prow, 9,700 feet. Four plants (*Arabis lyallii*, *Poa* sp., *Polemonium viscosum*, and *Phacelia sericea*) were noted in the pumice of Steamboat Prow Ridge, some of which may serve the squirrel for food. The next day (August 7) an individual was observed at an altitude of between 10,000 and 10,500 feet on Emmons

Glacier, a considerable distance from any rocks or earth. The animal was headed downhill, as if he had just been to the summit and was enjoying the experience very much.

CASCADE FLYING SQUIRREL

(*Glaucomys sabrinus fuliginosus*)

Description.—Length of head and body about 6½ inches; tail about 5¾ inches; ears moderate; eyes large and dark; a broad fold of loose skin extending from arm to hind leg; tail flat; entire form of the animal such as to present the maximum surface to air in course of parachute-like flights; fur extremely silky, doubtless offering little resistance to air and making passage of animal practically noiseless; claws sharp and curved, well adapted for clinging to upright tree trunk. In winter the upper parts are dark brown, the sides sometimes faintly washed with pinkish cinnamon; sides of face smoke gray or pale smoke gray, sometimes washed with light brown; eye ring dark; ears brown; hind feet dark hair brown; toes marked with buffy white, soles buffy or yellowish white, edged with brown; tail, above brown, shading to darker, beneath pale buffy, edged with darker; under parts light brown, the throat often creamy white. Summer pelage similar in color but more worn. The young are woollier and darker than the adults.

FIG. 49.—Flying squirrel, Paradise Park. A nocturnal animal usually living in thick timber. (Photograph from life by Walter P. Taylor and George G. Cantwell)

Identification.—No other animal can be confused with the flying squirrel, with the almost wing-like expansion of the skin of the sides of the body and the flat furry tail.

Occurrence.—From park boundaries to 5,500 feet. Collected at Mesler's ranch (2,000 feet), Paradise Park (5,400 feet), Longmire (2,700 feet), Ohanapecosh Springs (2,000 feet), Mountain Meadows (4,000 feet), White River (3,100 feet), Sunset Park (5,000 feet), Glacier Basin (5,935 feet), James Lake (4,370 feet), and Owyhigh Lakes (5,100 feet).

Habits.—This beautiful animal is abundant in many parts of the park, yet seldom seen and almost unknown as a result of its strictly nocturnal habit. One kept alive for some days moped about in its box, sitting ball-like with its flat warm tail curled around its sides or over its nose, head, and back. It was very timid, when liberated taking to the bark of a tree with agility and climbing by a series

FIG. 50. Flying squirrel, Paradise Park. Note the expansion of the skin along the side of the body and the broad, flat tail, which enable it to glide through the air. (Photograph from life by Walter P. Taylor and George G. Cantwell)

of quick jumps. Fecal pellets were egg-shaped, about one-fourth inch long. A young animal taken at Paradise Park promised to tame readily. It sometimes bit at our fingers or hands, but never hard enough to penetrate the skin. Its clinging powers were remarkable; the sharp curved claws enabled it to stick even to smooth wood surfaces. On being given a small bunch of raisins it sat up on its haunches like any other squirrel, holding the food in its fore paws.

In felling dead trees campers and woodsmen occasionally encounter flying squirrels. An old white pine stub, 20 or 30 feet tall, was to be cut down for firewood. As the stub began to sway and crack preparatory to taking its earthward plunge a small mouse-colored animal appeared. The lustrous dark eyes and the fold of skin along its side were conspicuous. As the tree began to

sway toward the ground the animal launched into the air, stretching out its arms and legs to their fullest extent and becoming a living parachute. Obliquely earthward it came, its ribbon-like tail fluttering. A long downward curve carried it nearly to the ground, when, with a sudden movement, carried by the momentum gained, it sailed upward and easily caught on the trunk of a large tree well above the ground. (Shaw MS.) We can imagine that the animal lost no time in scurrying to cover, climbing for the thickest part of the tree and promptly disappearing from view.

Fir cone seeds and the tender shoots of evergreens are said to make up the bulk of its food. Doubtless the berries of meadow and forest floor are also eaten. Dried fruit and meat are relished whenever they can be obtained.

The young were about half grown the first week in August, and already foraging about in the woods on their own account.

Flying squirrels were particularly abundant at Ohanapecosh Hot Springs, 15 being taken in one week, 5 in a single night. Several were trapped on trails through the forest, indicating that the animals do considerable traveling away from trees. Two others were caught in traps baited with fish and set at the water's edge for mink. The stomach of a spotted owl taken here was found to contain a flying squirrel.

Flying squirrels were abundant during September in the scattered clumps of alpine firs and mountain hemlocks about Paradise Park, though suitable stubs seemed few in number. At Reflection Lakes during July none was secured, though the locality appeared to be equally favorable.

PACIFIC BEAVER

(*Castor canadensis pacificus*)

Description.—Size large; head and body about 27 inches in length, tail about 16 inches; its scaled portion about $9\frac{1}{2}$ inches, width about $4\frac{3}{4}$ inches; weight perhaps averaging between 30 and 40 pounds, but sometimes much greater; beavers are heavily built, round-bodied animals, with chisel-shaped front teeth, short legs, fully webbed hind feet, and a flat, scaly tail; overhair long and coarse; under fur short, dense, and silky. Upper parts cinnamon brown, lighter before and behind, pinkish buff above the tail and on the cheeks; feet brown; underparts drab; base of tail often lighter brown.

Identification.—The large size, aquatic habit, and flat, scaly tail identify the beaver.

Occurrence.—Reported from certain tributaries of the Nisqually and Cowlitz Rivers only, below 3,500 feet altitude.

Habits.—The American beaver, national emblem of our sister nation to the north, is the largest rodent on the continent. His pelt has always been a prime desideratum of the trapper, and the exploration and development of vast areas in North America were encouraged and facilitated by the powerful fur industry to which this fact gave rise. His works have never ceased to be of perennial interest to man. So extensive are his dams, so large the trees he lays to earth with no other tools than his chisel-like incisors, and so

extensive the tracts of land flooded by him, that he is a widely-known symbol of industry. Probably few native wild creatures have been more intimately concerned with the building of empires than he. As Martin states, "Indeed, it is not asserting too much for the past greatness of the beaver trade to say that where the early traders halted and built their trading posts or forts there civilization has progressed, and thus unconsciously the foundations of our magnificent cities were laid, while some can claim a gradual development direct from the early beaver colony." (Castorologia, 1892, p. 88.)

On December 20–21, 1919, Roger W. Toll, then park superintendent, found a colony of beavers on Fish Creek, which drains Lake George and Round Pass and flows into Tahoma Creek. The dams

FIG. 51.—Beaver. From Biological Survey

were located at least 100 yards above the trail crossing and were not in sight from the trail. Toll reports that there were two dams, each 100 to 200 feet in length, the lower raising the creek some 3 or 4 feet, while the upper raised it about a foot. "The beavers are now living in these lakes, and fresh signs are abundant. There are numerous tracks in the snow leading from the lakes to the thickets of alder, elder, and willow which they are cutting. There is no typical beaver house in the lakes, but the under-water entrance to their house can be seen leading under the roots of a fir tree about 4 feet in diameter that stands on the edge of the upper lake." (Roger W. Toll, letter.)

During the third week in September we studied the work of beavers on Fish Creek perhaps 1½ or 2 miles below this location. Here beaver ponds are observed for a tenth of a mile along the stream to the point where it enters the rocky wash of Tahoma Creek. The surroundings are typical of the Canadian Zone forest, with western

hemlock and Douglas fir the predominant trees. Closer to the stream are numerous alders and willows, with a few maples and elders. Although freshly cut branches of devil's-club were seen afloat on the extensive ponds, the beavers themselves were not present. Apparently they had gone up creek to the workings later discovered by Mr. Toll. There are several dams, some of large size, the water in one place having been backed up to a depth of 6 feet. The trail, which the beavers have several times flooded, crosses the beaver ponds by a rude bridge which barely clears the water. One is struck by the depth and unusual clarity of the water, in which little current can be detected. Looking more closely one notes fresh green twigs of maple, alder, and willow, of small diameter, and from 3 or 4 inches to a foot in length floating on the surface.

FIG. 32.—Beaver dam, Tahoma Creek. Difference of water level above and below dam, 4 feet. (Photograph by Walter P. Taylor, Biological Survey.)

Many trees about the pond margins, some up to 2 feet in diameter, had been cut, leaving cone-like stumps. At least one recently used trail, almost a canal, led back from the water to the foraging area. Occasionally a tree is gnawed only a little, as if the beaver did not like the taste. Sometimes the beaver stands on a log and cuts into a tree. One stick of alder 6 feet long and 3 inches in diameter had been cut at both ends, trimmed, and almost completely denuded of bark, and in one place the beavers had cut into the hardwood beneath.

Perhaps the most interesting of all the beavers' works is the dam, which is of remarkable strength. Branches of trees, brush, fragments of driftwood, stones, and earth are almost inextricably piled together. In locating the dam advantage seems to be taken of any

natural obstruction, such as a log across the stream. Some trees appear to have been felled with the intent to help with the dam; but the beaver does not have good control of his timber, which often falls at the wrong angle. Some very heavy pieces of wood 6 feet or more long and 2 to 4 inches in diameter were found in the dams, showing that the beaver can carry, drag, or float a considerable load. Alder was the principal material utilized, though anything available, even the prickly devil's-club, had been incorporated into the structure.

The proximity of settlements and the high price of furs jeopardize the existence of the beaver, even where protected by law. Dr. A. K. Fisher records that several beavers lived at Longmire Springs until 1896, when a trapper killed them all. Their dam was still intact in the summer of 1897, and a number of trees on the border of

FIG. 53.—Western hemlock, 2 feet in diameter, cut by beavers, Tahoma Creek. (Photograph by Walter P. Taylor, Biological Survey)

the meadow, including willows, alders, and cedars, were about half gnawed through.

James McCullough, of Ashford, says beaver were found until recently in Bear Prairie (3 miles south of Longmire), and indications of their occurrence within a year in the form of old cuttings and dams were noted in that locality. McCullough believes that the animals have been quietly trapped out by poachers. Beaver sign is reported by Cantwell within the park along Stevens Creek and Nickel Creek.

With skins selling up to $40 each wholesale at the Funsten fur sales in St. Louis in September, 1919, it is easy to appreciate the economic value of the beaver. His esthetic attractiveness also is recognized by many persons; but his services as a soil builder have not been properly appreciated. The beaver dam changes the face

of the country in the immediate vicinity. Sedimentary accumulations of vegetation above the lava form deep deposits of humus which when drained and cultivated are wonderfully rich and productive.

CASCADE PIKA: CONY: LITTLE CHIEF HARE: ROCK RABBIT

(Ochotona princeps brunnescens)

Description.—Size about that of a guinea pig; length about 8 inches; form compact, tail short, not in evidence externally; limbs short; ears moderately large, rounded; eyes rather small; fur soft and moderately dense. In winter upper parts mixed light brown and blackish; sides light brown; sides of nose gray, washed with light brown; ears blackish, margined with light buff; feet light brown,

PLATE 14. Coney or rock rabbit, Spray Park. At entrance to its den. Its nest may be 300 ft. or only a few feet back in the rock slide. (Photograph from life by William T. Shaw, State College of Washington)

underparts grayish white, moderately or sometimes heavily washed with pinkish cinnamon. The summer pelage is similar to and often identical with the winter pelage, but general tone of upper parts averaging deeper cinnamon, the sides of head and body frequently rich cinnamon, shaded with blackish, and the underparts sometimes heavily washed with cinnamon.

Identification.—The coney is a small, grayish-brown, rabbit-like animal, active both in daylight and darkness, possessing conspicuous rounded ears and lacking any visible tail.

Occurrence.—In suitable rock slides from 3,000 feet (rarely lower) to 8,000 feet, chiefly in the Hudsonian Zone. Collected at Paradise Park (5,000–8,000 feet), Paradise Creek (5,600 feet), Indian Henrys (5,300 feet), Spray Park (5,500 feet), Sunset Park (5,000 feet), White River Park (5,900 feet), Stevens Creek (3,000 feet), Reflection

Lakes (4,900 feet), Owyhigh Lakes (5,100 feet), Carbon River (3,000 feet), Glacier Basin (5,935 feet), and Windy Gap (5,500 feet).

Habits.—According to the Bible, "The conies are but a feeble folk, yet make they their houses in the rocks" (Prov. 30:26), and this statement is true of our own conies, which, however, are not related to those of Bible lands. No talus slope amid the inspiring influence of timberline scenery would be complete in the absence of this interesting animal, though he is a timid and defenseless creature and does not make the emotional appeal of the chipmunks or Douglas squirrel. The cony resembles a tiny rabbit, to which indeed he is allied, being formerly regarded as a member of the same family. There are, however, numerous points of difference, among which the lack of any appreciable tail, the rounded ears, and the altogether peculiar habits, are conspicuous. One kept in camp was easily tamed.

FIG. 55.—Feeding a cony at Reflection Lakes. (Photograph from life by J. B. Flett, National Park Service)

The distinctive call note, often described as a bleat, may be spelled *enk* or *ee*, and is usually heard before the animal is seen. In its utterance the cony opens his mouth very wide. The call seems to be expressive both of interest and of inquisitiveness, and sometimes of alarm as well. Rarely a whole series of ejaculations is heard, *chika! chika! chika! chika! chika! chika! chika!* Dr. C. Hart Merriam in 1897 heard a cony make a low chattering cry suggestive of a wren and seemingly at or for the benefit of another cony. A cony call heard beneath one's feet has an emphatic quality due to its nearness, and savors, too, of the sepulchral, coming from deep down beneath the slabs of rock. His furry feet enable the cony to run easily and noiselessly over the rocks. He progresses with a peculiar spasmodic jerkiness, reminding one of a mechanical toy. Often he huddles up on a rock, appearing a forlorn little ball of discontent, when in reality he is doubtless quite happy. When

at rest the cony squats flat on his stomach. We have never observed him sitting on his haunches with his fore feet off the ground.

The cony's nest is located in some rock-walled chamber beneath the talus (see fig. 12), and is nothing more than a little mass of dead grass on which the cony sleeps. Sleeps, that is, if he sleeps at all, for the cony is nothing if not industrious, and is more nearly active at all times of the day or night than any mammal of our acquaintance. He can be heard at intervals throughout the day; he becomes most active at twilight; one may hear the characteristic *enk enk* through the night. On an automobile trip from Longmire to Paradise in company with Superintendent Toll during the foggy twilight, and again during the almost impenetrable darkness of a moonless night, the headlights disclosed conies actively at work, several running across the road during our passage.

Dull days are perhaps more favorable than others for studies of the cony. He is frequently seen bustling about even during a gentle rainstorm, or sometimes sitting motionless on a huge block of stone, apparently enjoying the drizzle.

While a timid animal, and almost defenseless so far as physical characteristics are concerned, it is apparent that the slide rock in which he lives affords him ample protection from many enemies, such as hawks, eagles, owls, the coyote, and other predators. But his deadliest foes are undoubtedly the marten and the weasels, two species of the latter preying on him. From these, particularly the latter, the rocks give little shelter. It is no accident that all three are quite regularly found in the vicinity of cony slides.

The cony feeds on grass and green vegetation. Excepting possibly the mountain beaver, he is the most remarkable haymaker in the mountains. The harvest is begun in midsummer, about August 1. Several paths usually radiate from the edge of his rock slide into the near-by meadows. In routing these trails the animal takes full advantage of each bowlder, log, or bit of brush, finally reaching the main foraging area. After snipping off a load of green vegetation the cony carries it to his "haymow." Under the shelter of a shelving rock, safe out of the rain, his hay is piled to dry, bundle after bundle being carried in until no room is left. Usually the vegetation is wedged in very tightly, so tightly indeed that it is difficult to understand how the wedging process is accomplished. Accessibility and availability of the plants have most to do with their selection. Among the species utilized are ferns, including maidenhair (*Adiantum pedatum aleuticum*) and rock brake (*Cryptogramma acrostichoides*), alpine fir (*Abies lasiocarpa*), sedge (*Carex* sp.), squaw grass (*Xerophyllum tenax*), deertongue, or avalanche lily (*Erythronium* sp.), false hellebore (*Veratrum viride*), alder (*Alnus* sp.), mountain dock (*Polygonum bistortoides*), western anemone (*Pulsatilla occidentalis*), coltsfoot (*Petasites frigida*), *Lutkea pectinata*, rose (*Rosa* sp.), *Spiraea* sp., mountain ash (*Pyrus occidentalis*), lupine (*Lupinus* sp.), white heather (*Cassiope mertensiana*), red heather (*Phyllodoce empetriformis*), *Menziesia ferruginea*, blueberry (*Vaccinium* sp.), lungwort (*Mertensia lævigata*), red elderberry (*Sambucus callicarpa*), and Sitka valerian (*Valeriana sitchensis*). In most instances the different kinds of plants are separated in the stored material, probably due simply to

the fact that the cony often works on one species at a time. The characteristic pellet-like droppings of the animal are found throughout the masses of stored vegetation. Extraneous material, such as sticks, pine cones, and fecal matter of coyotes, were found in isolated instances, apparently indicating that the cony has a collecting habit like that of the wood rat. Dr. C. Hart Merriam in 1897 found a couple of quarts of marmot dung piled up with stacks of cony hay. The amount of accumulated vegetation varies from a few sprays to a bushel or more. J. B. Flett tells of finding a cony stack on Eagle peak which reached up to his ear as he sat beside it. The pile of vegetation was so broad that he was unable to reach across it with his outstretched arm. The haystack of one cony was noted in a small deserted building belonging to an abandoned camp.

FIG. 56.—Cony nest, Spray Park. A simple mat of dead grass found in an enlarged chamber in a rock slide. (Photograph by William T. Shaw, State College of Washington)

Rarely the plants are spread over the rocks, as if to dry before being packed away. Apparently the same storage places are utilized year after year, as considerable accumulations of dead twigs from the stores of former seasons may often be observed. In one place a quantity of *Mertensia* cuttings had been stored so green that lower portions of the mass were sweating and resembled silage.

The young are apparently born in midsummer. Cantwell reports taking a male August 15 which had the sex organs highly developed and the glands on the sides of the neck swelled to an unusual size.

Marmots, little chipmunks, mantled ground squirrels, and white-footed mice are frequently found in the same rock slides with the cony. Apparently all live in the same habitat on good terms. The color of the cony usually harmonizes well with its rock surroundings, but sometimes, on the lighter-colored bowlders, it becomes conspicuous.

The conies on Mount Rainier showed an interesting range of adaptability to different conditions. While most common in the Hudsonian Zone, individuals were observed by Dr. C. Hart Merriam

to 8,000 feet, where they were surrounded by snow and ice. Doctor Merriam also found conies living in burrows among the dwarf trees above a mass of slide rock near Sluiskin Falls, Paradise Valley. The slab pile of an old sawmill at Glacier Basin was the home of one colony, and sometimes the logs and tangled windfalls on steep hillsides and in ravines served as congenial habitats. In a few places conies were found at unusually low altitudes, as at Longmire (2,700 feet), where one was living in the rock wall near the photograph gallery and feeding upon alder leaves, at Muddy Fork of the Cowlitz River (2,700 feet), and at Ohanapecosh Hot Springs (2,000 feet). According to Cantwell, a family of two conies, including a parent and a young one, was living at Ohanapecosh in a burrow beneath the root of a fir tree beside the trail, where the animals were seen daily for nearly a week. In the deep woods of this locality the animals were quite outside their normal environment.

FIG. 57. Portrait of cony or rock rabbit, Reflection Lakes. The round ears suggest a guinea pig, the soft fur-padded feet a rabbit. From specimen posed in natural habitat. (Photograph by William T. Shaw, State College of Washington)

The cony is active all winter. On September 27 one was heard calling during a snowstorm. The cony has also been observed busily adding to his haystack at intervals between snowstorms. On December 26, 1919, J. B. Flett heard three conies in the rocks forming the terminal moraine of Nisqually Glacier. The day was cold, with some wind, and they did not venture forth while he was in the vicinity. On visiting the same place the latter part of January, Flett found the triangular tracks of the cony, resembling those of a rabbit, in the snow. One studied during midwinter on Eagle Peak was found to have traveled 8 feet and on another occasion 100 feet over the snow from his haystack to some projecting rocks.

WASHINGTON VARYING HARE; SNOWSHOE RABBIT

(*Lepus washingtonii washingtonii*)

Description.—Size about that of a domesticated Belgian hare; length of head and body 15¼ inches, tail 1½ inches. In summer upper parts dull dark cinnamon brown, darkest on top of head and back, where washed with black, paler and clearer on sides of body; nape dull rusty; outside of ears in front like top of head but becoming darker on terminal half; outside of ears behind bright rusty or rusty whitish, with a broad terminal black band extending as a narrower band over tip in front; top of tail black; underside of tail varying from dingy gray to dull cinnamon or rusty buff; underside of neck similar to sides of body, or sometimes brighter, like sides of head; rest of under parts white, except where color of flanks some-

FIG. 58.—Snowshoe rabbit, Longmire Springs. (Photograph from life by William L. and Irene Finley)

times encroaches on sides of abdomen. In winter in the lowlands the pelage merely puts on a slightly paler or more vinaceous cinnamon tinge; but in Mount Rainier National Park a white winter coat is assumed. The young are similar to adults, but have woolly pelage, the upper parts darker and more deeply reddish brown, and the underparts dingy white, washed with dull rusty.

Identification.—The Washington varying hare may be known by its large round eyes, slender legs, short tail, and long ears. It is apparently the only rabbit occurring in the park.

Occurrence.—In the southwestern part of the park only, below 5,000 feet altitude. Specimens were taken at Mesler's ranch (2,000 feet), Longmire (2,700 feet), and on the southwest slope of the mountain at 3,500 feet.

Habits.—The term varying hare is given to this group of rabbits because of seasonal variations in their color. The other name,

snowshoe rabbit, refers to the well-padded hind feet, which enable the animal to hop and run easily in the soft snow. The Washington varying hare is an unusually interesting member of the group, for in winter in the lowlands of western Washington, where it is common, it changes only slightly, while on Mount Rainier it puts on a white winter coat. Specimens from Mount Rainier have been compared with those from western Washington, but no true specific or even subspecific differences have been found.

The rabbit is found in grassy meadows, brushy thickets, and the deep woods. As Finley says, it is ordinarily shy in the woods, but where protected soon becomes acquainted with man. (Mazama, vol. 5, 1919, p. 322.) Twelve or 15 of the animals were found in the vicinity of the National Park Inn, Longmire, where some were living under the tent platforms. Two fed during the winter of 1918–19 by J. B. Flett became quite tame. One of these could often be seen about the yard, and Finley says it reminded him of a toy hobbyhorse, as its big padded hind feet rolled up as it jumped. One day in July an individual was seen breakfasting on green vegetation in the vicinity. The entire plant was snipped off close to the ground and completely consumed. As the rabbit breakfasted its eyes and ears were ever watchful, any sound of a suspicious nature immediately catching its attention. As usual, the animals were more active during the twilight than at other times.

Scattering rabbit sign was seen to an altitude of 5,000 feet on the ridges and parks of the Indian Henrys district, becoming more abundant in a brushy southwest-facing burn south of Tahoma Creek, and most numerous in the deep woods on the Tahoma Creek bottoms. Abundant sign was noted also to an altitude of 4,600 feet on the south side of Mount Wow. The rabbit was found only in the Nisqually River Valley, in the Longmire, Tahoma Creek, and Indian Henrys districts.

A young one only about one-third grown was caught by Vernon Bailey in his hands at 3,500 feet altitude on Tahoma Creek August 13, 1897.

The range of the rabbit is coincident with the area in the southwest portion of the park, where carnivores, particularly martens, coyotes, bobcats, and mountain lions, are especially abundant. Perhaps the abundant rabbits, occurring here and nowhere else in the park, prove an attraction to these species.

CANADIAN ELK; WAPITI

(Cervus canadensis canadensis)

Description.—Size large; length of head and body 8 or 9 feet, tail about 8 inches; an average bull at full growth is said to stand nearly 5 feet at the withers and to weigh about 700 pounds; the size is extremely variable; antlers many-tined, the beam behind; well-marked brow and bez tines; tail short; muzzle naked and moist; neck maned; tufted gland on inside of hock. Color, winter coat brownish gray, a little darker along the spine, becoming dark brown on head, neck, and legs, and reddish brown on breast and belly; disk or rump patch very large, pale buffy white, continued above the tail, which is the same color; bordering this patch in front,

on each ham, is a brownish black stripe that nearly fades out toward the spine, where it joins its fellow. In spring these colors are said to become faded, so that the animals appear paler. The summer coat is redder than the winter coat.

Identification.—The large size of the bull elk, its maned neck, and its majestic antlers, well identify it. Cows can be told from deer by their considerably larger size.

Occurrence.—Formerly, perhaps still in small numbers, on White River. It is also reported that elk occasionally stray into the park from the south.

Habits.—G. F. Allen, of Tacoma, Wash., supervisor of the Rainier National Forest, asserts that a short while ago a number of elk were found in the park in the White River section, but, in his opinion, they have all, or nearly all, been killed off, for they drift back and forth over the park boundary and have been subjected to illegal shooting by Indians and whites as well. R. M. Daugherty saw three in Grand Park in 1915. Former Park Ranger O. W. Curtis saw tracks of three elk in 2 feet of snow below White River Ranger Station in March, 1919. Sherman Combs, also a former park ranger, reports elk tracks seen last year between Owyhigh Lakes and Ohanapecosh Hot springs. Supt. Roger W. Toll saw a track, much too large for a deer, near Wauhaukaupauken Falls about the middle of September. C. A. Stoner, of Ashford, whose experience in the Rainier region is extensive, is of the opinion that a few elk still range on the east side of the park.

There have been several introductions of elk in counties of Washington near Mount Rainier Park. Forty-two head were shipped from Yellowstone National Park to King County in the winter of 1912. Some of these were liberated near Snoqualmie Station, Wash.; others, according to reports, near Enumclaw, Wash. In January, 1913, 50 elk were transferred from Yellowstone Park to North Yakima, Wash., being liberated on Bethel Ridge east of the Cascades. Fifty of the Yellowstone elk were shipped to Kittitas County in March, 1916, being turned loose on the Wenatchee National Forest. It can not be stated with certainty from which of these herds the elk formerly or at present ranging in the Rainier Park were or are derived.

William Sethe, of Lewis, Wash., reports the persistence of a limited number of native elk west of the Cascade summit in the headwaters of the Cispus and Cowlitz Rivers, in Skamania and Lewis Counties. C. A. Stoner thinks elk observed southerly within and near the park belong to this group, which he believes to be increasing in numbers. Alden Sampson was told in 1906 of the presence of a few elk in the Tatoosh Range and on Goat Mountain (Mount Wow), but neither he nor any members of the Mazama or Sierra Clubs actually saw any of the animals. (Sierra Club Bulletin, vol. 6, 1908, p. 32.)

It is to be hoped that the elk may become a permanent feature among the wild living resources of Mount Rainier. If further introductions are provided for, however, the Roosevelt elk of the Olympic Mountains rather than the elk of the Yellowstone region should be utilized, for the Roosevelt elk is probably the species which formerly occurred throughout the Cascade Mountains.

MULE DEER

(Odocoileus hemionus hemionus)

Description.—Size large; length of head and body of males about 5 feet, tail 7 inches, ear about 10 inches; weight of bucks about 200 pounds, does smaller. Color of summer coat rusty yellow or reddish. The winter coat is brownish gray, grizzled with blackish; inside of legs, belly, and patch on buttocks white; face and throat dull white, with large black patch on forehead and black bar around chin; tail white, except bunch of hair on tip black all around; legs below knees brown; breast sometimes brownish black. The fawn is dull yellowish, thickly spotted with white.

Identification.—Likely to be confused with Columbian blacktail only; from this the mule deer differs in having tail narrow, spreading somewhat at tip like that of a mule; the tail is white, except that the bunch of hair at tip is black; the Columbian blacktail has a broad tail, which tapers toward the tip, all black above, white below. The hock gland is about 5 inches long in the mule deer, but shorter (about 3 inches long) in the Columbian blacktail. The mule deer can not be distinguished from the Columbian blacktail by its antlers.

Occurrence.—May occur in small numbers in the White River region, on the east side of the park.

Habits.—Pete Starbo, a miner of 15 years' experience in the White River region, says the mule deer is found in this section. John Anderson, miner, packer, and rancher, of Yakima, Wash., intimately acquainted with the mule deer and with the park, testifies to the same effect, as do also Jim Reese, packer, of Ashford, Wash., and former Park Ranger Wallace Newsom, of Aberdeen, Wash.

All deer seen by our party were Columbian blacktails. The mule deer is common east of the Cascade summit, and may regularly range westward to the east slopes of Mount Rainier, as do a number of other Cascade species of birds and mammals.

COLUMBIAN BLACK-TAILED DEER

(Odocoileus columbianus columbianus)

Description.—Head and body between 4 and 5 feet in length; tail about 6½ inches; big bucks will perhaps approximate 200 pounds in weight. In summer these deer are rich rusty red, with some blackish in middle line of back; under parts paler, chin, belly, insides of fore legs, and upper part of hind legs white; tail above blackish, below white, margined with blackish. In winter upper parts grayish brown, strongly grizzled with blackish on head, nape, ears, and middle line of back; ears with white spot at base, insides white; tail very broad, above black, below white; underparts grizzled grayish brown, but area on chin, insides of fore legs, and upper hind legs and belly white. A moderate concentration of blackish between fore legs.

Identification.—The broad, black tail is sufficient to distinguish this deer from any other. Deer tracks may easily be told from goat tracks, being small and pointed in front rather than broad and rounded. Can not be told from the mule deer by its horns.

Occurrence.—Park boundaries to at least 6,000 feet. Apparently most abundant on the west side.

Habits.—These fine game mammals, distinguished for their size, beauty, and grace of movement, are of surpassing value as an asset of Mount Rainier National Park. Unfortunately, they are not particularly abundant, for reasons which are not far to seek. J. B. Flett writes (in letter) that on the south side of the mountain, where there are many automobiles on the road and people coming and going continuously, the deer become quite tame and constitute a very real attraction to tourists. These tame animals wander over the park boundary or are forced over by bad weather, and during the hunting season fall an easy prey to gunners. In 1918, according to Flett, at least 16 deer were shot near the south boundary. Cantwell reports that 4 were killed near Bear Prairie, 3 miles south of Longmire, during the first week of the hunting season (fall of 1919).

FIG. 59.—Columbian black-tailed deer, Van Trump Park. (Photograph from life by J. B. Flett, National Park Service)

Apparently the only way to effect a substantial increase in the number of deer is to establish a game preserve outside the park of sufficient area to safeguard the deer's fall and winter range.

In former years there was considerable poaching in the park. Alden Sampson in 1905 saw one string of a dozen or 15 deadfalls which had been baited with deer meat and set for marten two winters previously. (Sierra Club Bulletin, vol. 6, 1908, pp. 33–34.)

According to local observers, the deer population is subject to fluctuation in numbers from year to year. Burgon Mesler, of Ashford, Wash., says deer were very scarce in 1900, but gradually increased up to 1916, when they underwent a marked decrease, perhaps due principally to the hard winter.

During the summer months the deer seek the higher levels of the park, where open spaces afford more sunlight and grass. They are especially fond of burns, where the thick vegetation provides an abundance of browse.

During the day deer usually lie under cover of thick brush or trees; but in the morning and evening twilight, as well as on moonlight nights, they roam in search of pasture.

There are few prettier pictures than that of a deer on a mountain meadow just at sunrise. The lupines and paintbrushes glisten and sparkle as the light catches their brilliant petals, and the handsome animal with its alert and attractive appearance impels one to an even greater appreciation of the beauty of the scene. Or perhaps a deer is jumped from among the logs and vegetation of an old burn. The flight of the agile animal is fascinating, as it bounds lightly over the tangle of fallen trunks, comes down stiff legged each time, and immediately leaps again as if each hoof tip contained a hidden spring. For a few rods it proceeds without stopping; then its curiosity compels it to swing about and investigate. It has trans-

FIG. 60.—Columbian black-tailed deer on meadow, Longmire Springs. (Photograph from life by J. B. Flett, National Park Service)

formed the blighted landscape of the burn to a region of life, action, and interest.

Deer possess a marked sense of curiosity. If one speaks to them or whistles they will nearly always stop and look. They are much more shy in the open than in the shelter of the bushes, even where only slightly protected. In the coverts one can approach them closely, while in the open 25 feet is as close as one can get.

Fawns are running with their mothers by the middle of July, the tracks of both young and adults being seen thereafter until late in September. The shores of glacial tarns are favorite resorts of deers, as are also the rocky sand bars along the Nisqually, White, and Carbon Rivers. J. B. Flett says that whenever the mother ventures into the open the young fawn is concealed in the forest by the doe. If she sees the observer going into the woods she at once starts for the fawn and tries to get it out of sight, and if the intruder ventures too close she sometimes even shows signs of fight.

Deer are frequently to be seen in the evening twilight near the mineral springs at Longmire. Sometimes, indeed, they loiter in the vicinity for hours at a time. Both bucks and does are often seen also on the road between Longmire and Paradise. Pete Starbo, road boss, found a fawn in this region. The little animal was not shy and permitted itself to be petted. Deer are not infrequently observed in the vicinity of Paradise Inn.

Flett writes that no deer winter as high as Longmire, though he found a small band in winter quarters near Kautz Creek at the west base of Rampart Ridge. They are preyed on by the bobcat, cougar, timber wolf, and coyote.

MOUNTAIN GOAT

(Oreamnos montanus montanus)

Description.—Height of male at shoulder about 3 feet; length of head and body 5 feet 6 inches; tail 4 inches. We have no actual weights; old billies probably weigh up to 400 pounds. Color uniform white, sometimes with a dirty appearance; some skins have a faint wash of yellow in middle line of back and belly, and in some there is a suffusion of this color over entire pelage; the hairless portion of nose and the horns appears black; over hair long and coarse; under fur woolly and fine.

Identification.—The large size, shaggy white hair, short unbranched horns, and awkward-appearing heavy body suffice to identify this animal. The tracks of the goat are broad and square, while those of the deer are pointed. In the goat, also, the dewclaws are so large that they often make large impressions behind, almost as large as real hoofs. (Dr. C. Hart Merriam.)

Occurrence.—Found all around the mountain, in summer usually at or above timber line (6,500 feet) in the Arctic-Alpine life zone. In winter they are forced into the lower country.

Habits.—The mountain goat is unquestionably the most interesting animal in the park. Although it is estimated that there are at least 500 of the animals in this area, any mountaineer who obtains the sight of one may consider himself fortunate. Here, contrary to the usual case, the animal is extremely wary; and his Arctic-Alpine surroundings afford innumerable opportunities for eluding observation. Remarkably light on his feet for so heavy-bodied and clumsy-appearing an animal, the goat is able to negotiate ice, snow, and rock slopes of unbelievable steepness. J. B. Flett, who has studied the animals at intervals for more than 25 years, writes that for a long time he followed goat trails through the mountains on the assumption that a man could go wherever a goat could, but he was compelled to abandon this opinion.

The mountain goat's chief feeding grounds in the summer are the green slopes and valleys above timber line. On the approach of danger he retreats to the higher slopes of the mountain. He likes to sit on his haunches like a dog on the old snow or ice of the glacier, sometimes maintaining one position long enough to melt deep cavities in the snow. In such a place he is doubtless freer from insect pests than elsewhere. When the supply of food is scant at high levels he feeds in meadows below timber line, and when the first severe snows

come, usually about the 1st of October, he descends into the timber and brush at about the altitude of the terminal moraines of the glaciers or lower, depending on the depth of the snow. He passes the winter in these forested retreats, seldom venturing into the open. (J. B. Flett MS.)

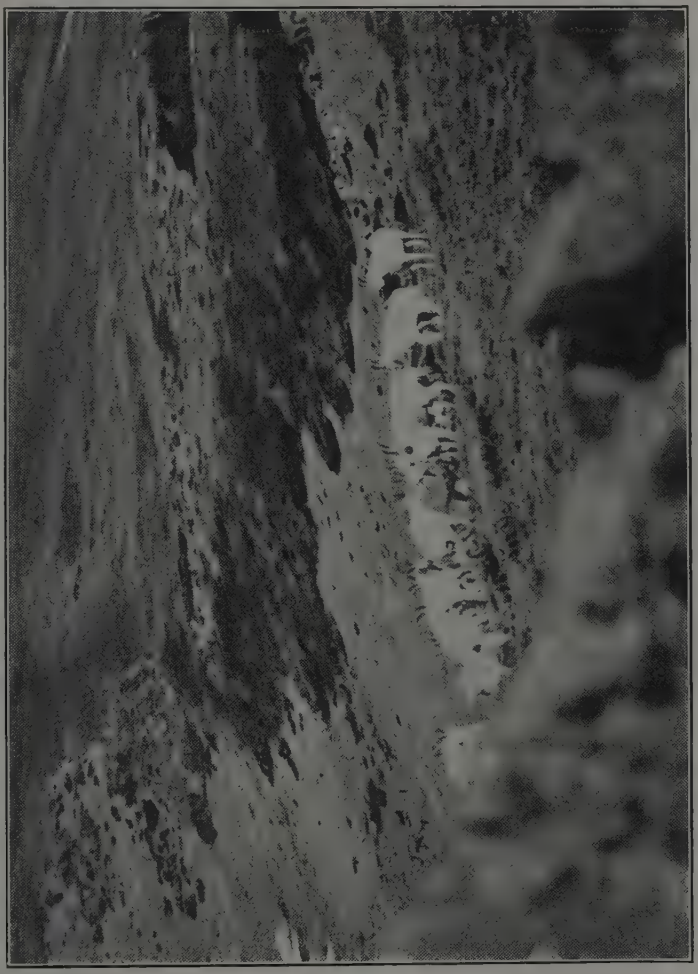

FIG. 61.—Mountain goats at Panhandle Gap (7,000 feet), east slope of Mount Rainier. (Photograph from life by Charles S. Gleason)

On August 21, at 7.45 a. m., a band of mountain goats was observed from our camp in Glacier Basin crossing St. Elmo Pass about a mile distant. The animals moved for the most part single file, traversing the faces of several steep and rocky cliffs, and finally crossing Interglacier in the direction of Mount Ruth. Later the same band was

located lying on a ridge about 500 feet below the summit of this mountain. One old billy was in an exposed place where he could obtain a broad view of his surroundings. This propensity for watchfulness is characteristic. In numerous instances their abundant tracks showed where the goats had run down from the main ridge onto an observation point from which they could command a panorama of the whole region.

On leaving this resting place the goats traversed a pass between Mount Ruth and Camp Curtis, passed within 300 feet of the observers, and descended at once to the precipitous slopes and rock chutes facing Emmons Glacier. Thirty-one goats, including six kids, were counted. The little goats have a high whinny, a little like the *meow* of a cat.

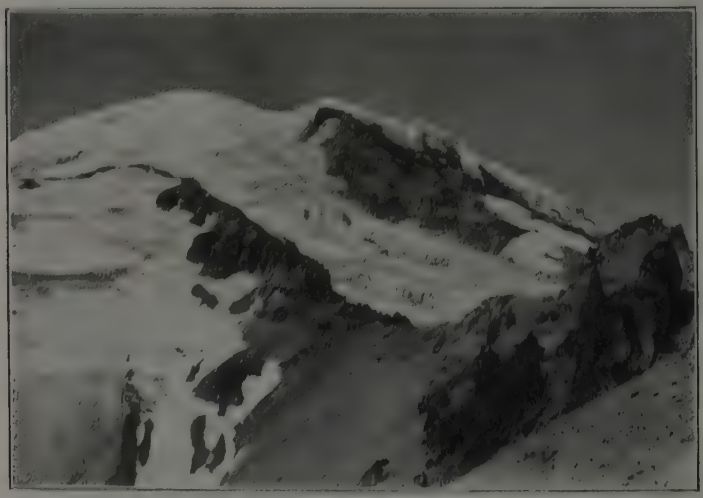

FIG. 62.—Habitat of mountain goat. Mt. Rhine Pass in foreground; Steamboat Prow at apex of wedge in middle distance; Russell Cliff is the dark precipice in the background at the right. Interglacier appears in the foreground at the left, Winthrop Glacier at the right. The eminence to the left of Russell Cliff is the main summit of Mount Rainier. (Photograph by J. B. Flett, National Park Service)

In traveling, the herd proceeded in a leisurely manner, for the most part walking rather than running, and apparently selecting their route with some care. An old billy was always in the lead. In narrow or difficult places they walked single file. In crossing particularly dangerous stretches some seemed to hesitate, but all negotiated the route in safety. As they went they dislodged many stones and much loose slide rock. In fact, their route was marked by small avalanches with the accompanying dust. On starting a slide of this sort in a rock chute the goat would stop, often on what appeared to be a very dangerous place, and contemplate the bounding stones apparently with interest.

About a dozen of the goats descended to the surface of Emmons Glacier, proceeding until stopped by some deep crevasses, and returning to the mountain as soon as the observers were safely out

of the way. On the glacier, where the going was good, they broke into a galloping trot. Previous to their flight to the precipices above Fremont Glacier they kept well bunched, but on the face of the cliff they spread out somewhat.

The forage area of this particular band includes Rampoughs Mountain, Winthrop Glacier, Interglacier, Steamboat Prow, Mount Ruth, Fremont Glacier, and Goat Island Mountain, an area embracing approximately 15 square miles.

The mountain goat is often seen on the cliffs. In the distance he often looks like a white speck stranded halfway up some sheer rock wall. Steeply sloping smooth rock surfaces, or even glare ice, have few terrors for him. And his ability to traverse almost perpendicular rock cliffs can not fail to excite wonder and admiration.

Two observers descried a large billy on a ridge near St. Andrews Park. While one tried to keep out of sight and get beyond him the other remained in an exposed position on the ridge and waved his hat slowly back and forth. This excited the goat's curiosity. He was half a mile distant and slowly began to approach. Something frightened him before he had gotten very far and he disappeared into the timber.

Flett relates an incident from his wealth of experience with goats which well illustrates their curiosity where any unusual object is concerned. His party on coming down the north slope of Puyallup Glacier after a strenuous hike from Indian Henrys suddenly encountered 25 goats feeding as usual on the tender grasses and sedges above timber line. The goats scurried off across the slope and into the upper timber line meadows. Camp was established about three-fourths of a mile beyond them. After supper and a little rest Flett and a young man named Phillips took kodaks and went in pursuit. The goats first caught sight of Flett, who was approaching them from in front, while Phillips was drawing in on them from the rear. A big billy on a knoll centered all his attention on Flett. As the man crawled in a zigzag course closer and closer the goat became more interested than ever. By this time Flett was now only 150 feet from the goat; Phillips, meantime, had approached him from behind to within 30 feet. The billy became uneasy, shaking his head in a threatening manner. Flett tucked his handkerchief under his shirt collar and let it hang down to a point resembling a goat's beard. Then he confidently crept along over the snow toward the goat. The latter began to stamp his feet, shake his head, and throw up his hind quarters. Phillips, meantime, had assumed an erect position not far from the goat. Flett attempted to imitate the goat's actions, spatting the snow with his hands and throwing his legs in air. The goat's curiosity was aroused to the highest pitch. When Flett uttered an imitation *ow ba-ah* Phillips laughed. The billy turned and, seeing Phillips standing alongside, gave a leap into the air, hitting the earth with a bound at a much reduced altitude toward the glacier, and soon disappearing over the crag. Flett followed his tracks until it became too dangerous to go further, the cliff at this point being about 2,000 feet high. In five or ten minutes the goats were seen crossing the glacier, led by the big billy. They headed for a precipitous bluff on the opposite side and proceeded to climb to the summit.

The females evidently bear one or two young. Each of two nannies seen at St. Andrews was accompanied by two kids; a billy seen in the same locality was followed by a single one. Kids seen the middle of September were about half grown. Of five individuals found resting in the rocks at the snout of Puyallup Glacier (4,600 feet) one was a nanny, one a billy, and three kids. Startled, they escaped by running up a very steep rock slope. The kids had been lying near the nannie; but in the flight two accompanied the billy, one the nannie. The billy butted one up the slope and the other followed. (Flett MS.)

C. A. Stoner, of Ashford, Wash., says it is customary for mountain goats to feed on alternate days, a given band often lying up all through one day. He states that herds seen often consist of year-

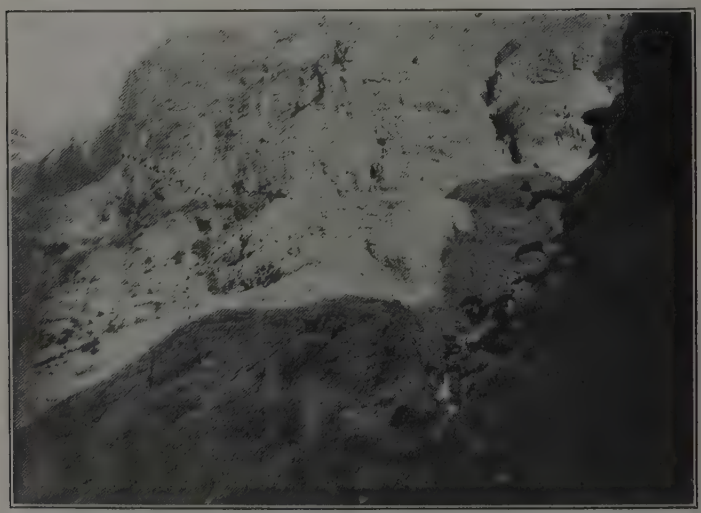

FIG. 63.—Trail of the mountain goat taken at the terminal moraine of Puyallup Glacier. Dotted line shows route followed by three goats. (Photograph by J. B. Flett, National Park Service)

lings, nannies, and kids, billies over three years of age often remaining off by themselves. The early morning and late evening are favorite feeding times.

Sometimes herds of considerable size are seen. Thus Flett saw 62 goats on the flat above Panhandle Gap in July, 1903. O. Brevik, a miner at Glacier Basin, saw 57 goats in August, 1916, on the face of one of the cliff-like walls of the basin.

Goat tracks in the soft pumice, droppings, rolling and bedding places between the rocks, and bunches of wool adhering to the vegetation clearly show the presence of the animals even when one does not see them. Bedding places are practically always on eminences such that the goat commands a broad view of the surrounding country while he rests. The animals like to roll or rub themselves in suitable sandy places. If they can rub up against a tree, so much

the better. One scrubby timberline fir was found with its branches quite clogged with goat wool.

In the Rocky Mountains, as, for example, in Glacier Park, the goats remain at high altitudes during the winter. Here the snow is swept from the dwarf plant growth and food is always available. Their dense woolly coats furnish protection from the severest cold and storms. (See Bailey, Wild Animals of Glacier National Park, 1918, p. 30.) On Mount Rainier, however, the precipitation is much greater, and the case is very different. The rocks above timber line are frequently bathed in clouds and storms, and often in consequence are covered with glare ice. Food is then practically unobtainable, and life in the Arctic-Alpine Zone is simply impossible except for such animals as burrow or live under projecting rocks.

During the heavy snowfall of 1917 Flett writes that a band of 20 or more goats passed down the road below Longmire (2,700 feet), using a snowshoe trail for their pathway through snow about eight feet deep, making a deep trench in the road for a mile and then turning into the timber. The animals evidently took turns in breaking trail, just as a party on snowshoes would change. The same observer writes further that the goats left the Arctic-Alpine heights above Van Trump Park on October 8 during the fall of 1919, traveling in two groups, just after a storm. The tracks of the animals were distinct, showing that they did not move until the storm had passed. Although the weather moderated afterwards and left the grassy slopes of the park beautifully green, the animals did not return even as high as the Alpine meadows. They remained in the timber just below the meadows until the winter weather drove them still farther down.

Superintendent Toll (in letter) reports that mountain goat tracks were thick along Rampart Ridge (4,000 feet) near Longmire December 20–21, 1919. During the fall of the same year J. B. Flett made a careful study of the goats in this vicinity and found them eating the following plants: Small red huckleberry (*Vaccinium scoparium*), blackberry (*Rubus macropetalus*), mountain bramble (*Rubus lasiococcus*), twin flower (*Linnaea borealis longiflorum*), Oregon grape (*Berberis nervosa*), dwarf cornel or bunchberry (*Cornus canadensis*), evergreen violet (*Viola sempervirens*), pipsissewa (*Chimaphila umbellata*), and rattlesnake plantain (*Peramium decipiens*). Alder buds and willow twigs are also eaten in winter. In one place a bench was found where a group of goats had evidently undergone some hardship during a previous winter, having eaten the bark off the mountain alders in the vicinity. It will be observed that most of the plants mentioned grow close to the ground. Flett observes that while he watched the goats did not touch the tall shrubs at all, but would pull up a vine and nip it off, shaking it in the process, immediately turning their attention to some other species growing close to the ground. Goats observed in summer at Glacier Basin were eating a sedge (*Carex*). In midwinter Flett says the goats do not roam about much, except as compelled by depth of snow to seek food lower down.

The goats sometimes range from Mount Wow into the mountains to the west outside of the park boundaries, and also to the mountains

south of the park by way of the Tatoosh Range, and they travel freely between Mount Rainier and the Cascade summits to the east.

Of 14 correspondents of the Biological Survey residing in Pierce and Lewis Counties, Wash., 2 believe the mountain goats to be increasing in numbers in the Rainier region; according to 2 others they are stationary; and 10 are of the opinion that they are decreasing.

The Indians formerly killed many goats for food. There is probably some killing of goats outside the park boundaries, legal and illegal, and there may be some poaching inside. Perhaps this at least partially accounts for the wariness of the animals in the park.

THE BIRDS

Bird study was probably never more popular nor bird lovers more numerous than at the present time. This is fortunate, for few lines of inquiry are better fitted to provide wholesome recreation, absorbing instruction, and genuine inspiration. The growth of interest in birds is of special timeliness, also, because of the need for better protection of valuable game and insectivorous species by the various States and the Federal Government. Recruits in ever-increasing numbers are needed by the army of conservationists; the apathy of the general public and the unwillingness of various special interests to favor the drastic reforms necessary call in no uncertain terms for vigorous and aggressive attention.

The birds of the park may be divided into four classes: Permanent residents, such as the Rainier white-tailed ptarmigan; summer residents, such as the western robin; winter visitants, such as the black-billed magpie; and migrants, such as the golden-crowned sparrow. The first, second, and last classes involve a considerable number of species, the third class an inconsequential number.

Available data regarding migration and nesting of birds in the park are meager. All who are able to make observations regarding dates of arrival and departure of migrants or residents for part of the year can be sure of making real contributions to science if they will send copies of their field notes to the park naturalist of Rainier National Park, Longmire, Wash. Information regarding nesting activities is also particularly desired.

RED-BREASTED MERGANSER

(*Mergus serrator*)

Description.—About the size of a domesticated mallard duck; length 20 to 25 inches; wing 8½ to 9 inches. The adult male has head and crest black, glossed with green; neck white; back black, middle of wings white; rump gray; chest buffy brown, streaked with blackish; belly white or creamy; sides gray. Female with head and neck brown, darker and duller on crown and crest; rest of upper parts and tail slaty gray, except for white patch on wings; underparts white. Immature birds are like the female.

Identification.—The mergansers are often called "saw-billed ducks." This gives a clue to their principal differentiating character,

the slender, cylindrical "saw-edged" bill, with hooked tip. At a distance male mergansers appear black and white, and both sexes show white on the wing when in flight.

Occurrence.—A migrant and probably also a rare winter visitant, likely to be encountered on lakes or watercourses anywhere in the park.

Habits.—The red-breasted merganser, mainly a coast-loving species, occurs inland usually on the larger bodies of water. The lack of lakes of any considerable size on Mount Rainier doubtless accounts for the small numbers of mergansers and certain other water birds seen, and the total absence of still others.

A pair of mergansers was observed on July 30 at Ohanapecosh Hot Springs (2,004 feet), at the extreme southeast corner of the park.

FIG. 64.—Lake above St. Andrews Park. A typical glacial tarn on Mount Rainier. (Photograph by Walter P. Taylor, Biological Survey)

The birds were flying down the Ohanapecosh River opposite the springs, and while they were out of the park at the time they must have come from inside the boundary, which was not over 100 yards distant. Another bird, a male, was noted at the junction of Frying-pan Creek and White River (3,700 feet) on August 13.

AMERICAN PINTAIL; SPRIG; SPRIGTAIL

(*Dafila acuta tzitzihoa*)

Description. Males somewhat smaller (except as to length) than the average domesticated mallard duck; females are smaller than males; length of male 26 to 30 inches, wing $10\frac{1}{4}$ to $11\frac{1}{4}$ inches; of female 21 to $23\frac{1}{2}$ inches, wing $9\frac{1}{2}$ to slightly over 10 inches. The adult male has the sides of head snuff brown, with a purple gloss;

crown darker, back of neck blackish, a white stripe down side of neck; throat and under parts white; sides and upper parts gray crossed by wavy lines; wing slaty, with purple area bordered above by a line of buff and below by white; innermost flight feathers with broad stripes of velvety black and white; under tail coverts black. The adult female is gray, with head and neck finely specked, and under parts, including under surface of wing, finely mottled with dusky; back and wings more heavily mottled with black, brown, and buffy; wing without colored area, but greater coverts tipped with white.

Identification.—Its large size (at least as to length), narrow head without crest, and long, slender neck help to identify the pintail. The male has long central tail feathers, dark-brown head, with white neck stripes, and white under surface.

Occurrence.—A migrant and probably also a winter visitant. There is a possibility that the species breeds in the park.

Habits.—The pintail is one of the most beautiful of all wild ducks, especially in nuptial plumage. While its colors do not rival those of the wood duck or mallard in brilliancy, one must concede that its costume is in excellent taste and seems in perfect harmony with its surroundings.

The picturesque glacial tarns characteristic of Mount Rainier, while unusually attractive from the standpoint of scenery, are not well fitted for waterfowl. Their bounds are often set by rocky talus slopes or even snow banks, and the vegetation on their borders is scant at the best. A few lakes at moderate elevation are surrounded by thick woods and brush and furnish the requisite food and seclusion for these birds. Of such a character is James Lake (4,350 feet), which is well hidden in the forest on the north side of the mountain; and here two pintails, the only ones seen on the trip, were observed on August 23.

PACIFIC HARLEQUIN DUCK

(*Histrionicus histrionicus pacificus*)

Description.—Size medium, considerably less than that of a domesticated mallard duck, length 15 to 17½ inches, wing from slightly less than 7½ to 8 inches. The adult male in winter and spring has the head and neck bluish black, with white patches; collar white; shoulder bar black and white; middle of crown black, bordered behind by chestnut; chest and shoulders dark plumbeous; belly sooty, sides bright rufous; wing with steel-blue area and four white spots; rump black with white spot on each side. In summer the colors of the adult male are much duller than in winter. The adult female has the head, neck, and upper parts sooty, with a white spot on ear coverts and a large white patch on side of face; belly mottled grayish.

Identification.—The dark coloration of this duck above and below will separate it from others noted in the park. In addition to this, the medium size, small bill, and short and pointed tail constitute marks for field identification. The male has several conspicuous white patches on the sides of head and body, and also a white collar around hind neck, a white bar across side of chest, and a white patch

on wing. The female is dull brown with dull white spots on the head, the most conspicuous being below and behind the eye.

Occurrence.—A summer resident and probably also a migrant in the park.

Habits.—"No other duck has such an odd dress, and few have such an extraordinary mode of life as the harlequin duck." (Grinnell, Bryant, and Storer, The Game Birds of California, 1918, p. 188.) It is sometimes found on mountain streams in typical water ouzel surroundings, and is a remarkably expert swimmer and diver.

C. A. Stoner, of Ashford, Wash., reports seeing a pair of harlequins on the Ohanapecosh River not far from the park boundary the first week in August. A sharp lookout should be kept for these birds in the rough waters of glacier-fed streams. They are probably much more common than our single record would seem to indicate.

On May 26, 1920, J. B. Flett found a harlequin duck nesting on the sand and gravel of the Nisqually River three-fourths of a mile below Longmire. There was no attempt at concealment. The nest was located at the extreme end of the island so that the duck could fly into the river in any one of three directions. The nest was made of feathers, dried leaves, moss, and lichens (*Usnea sp.*). The eggs were seven in number. When the bird left the nest she carefully covered the eggs with feathers, and Flett reports that on several occasions the eggs were perfectly warm though the mother had been absent for more than an hour. The bird could be approached to within 5 feet before leaving the nest. She always flew into the river, and finally perched on a rock or log at a safe distance downstream, from which she watched the intruders. The eggs were put under a hen and hatched out in two or three days, but, though every effort was made to give them suitable food, the chicks died in a short time.

CANADA GOOSE; HONKER

(*Branta canadensis canadensis*)

Description.—Size of a domesticated goose; length 35 to 43 inches, wing 15½ to 21 inches. Head and neck black except for broad white band across throat and cheeks; body deep gray, feathers tipped with lighter; rump, tail, and quills black; upper and lower tail coverts and ventral region white.

Identification.—Recognizable in flight by abruptly black head and neck, gray body plumage, loud trumpetlike "honks," and slow wing strokes.

Occurrence.—A migrant. Flocks have been known to stop on the meadows at Longmire Springs, but only for a short time.

Habits. According to J. B. Flett, Canada geese are occasionally noted flying southward in the fall, honking a message of the north country to all sympathetic listeners within hearing. He reports that their flock formations sometimes approximate straight lines, at others assuming the more typical V shape.

NORTHWESTERN COAST HERON; GREAT BLUE HERON

(*Ardea herodias fannini*)

Description.—Length 42 to 50 inches, wing 17½ to 20 inches. The adults have upper parts bluish slaty black; top of head white,

bordered by black and with black occipital crest; shoulders black, striped with white; under parts heavily streaked with black and white; thighs and edge of wings cinnamon brown. In the breeding season the crest has two or more slender white plumes. The young

FIG. 65. California great blue heron (*Ardea herodias hyperonca*), San Francisco Bay, Calif. (Photograph from life by William L. Finley and H. T. Bohlman)

have the whole crown and crest black; wing coverts without white or rufous spots.

Identification.—The great size, bluish-gray plumage, spearlike bill, and ungainly long neck and legs separate this bird from any other in the park.

FIG. 66.—Reflection Lake. Habitat of great blue heron, spotted sandpiper, and water ouzel. (Photograph by William T. Shaw, State College of Washington)

Occurrence.—Probably a permanent resident, likely to be found in suitable situations anywhere in the park below 5,000 feet altitude. All those observed were noted south and southwest of the mountain as follows: Reflection Lakes (4,900 feet), July 16; Tahoma Creek

(2,500 feet), September 18; Lake Allen (4,596 feet), Mount Wow, fresh track seen September 20.

Habits.—Almost every explorer of marshes early makes the acquaintance of the great blue heron. Although ungainly and almost artificial in appearance, the heron is a most interesting feature of damp meadow and reedy lake margin.

Twilight is the best time for heron study; at this time the birds are more alert than at any other time of day, perhaps because the small aquatic animals on which they feed are most active then. At first glance the heron looks like a grayish snag sticking out of the water. He may remain in this position for some moments, especially if suspicious of danger or watching for prey. Cautiously he draws a foot out of the water, advancing it a step and silently immersing it with scarcely a ripple, all the while peering intently into the dark pools. The lightning thrust of the spear-like beak is in vivid contrast to the sedateness and deliberation of most of the heron's movements. Luckless the frog or other small animal which comes within range. If surprised by the hunter the bird stands startled for a moment, and then, crouching for a springing start, leaps into the air and flies away, making vocal his protest in a series of harsh squawks.

The occurrence of a pair of birds at Reflection Lakes (4,900 feet) July 16 suggests that they may have nested at that locality.

WILSON SNIPE; JACKSNIPE

(*Capella gallinago delicata*)

Description.—Size about that of a western robin (as far as length is concerned), length about 11 inches, wing about 5¼ inches. Bill long and slender, mandibles grooved, roughened, and widened toward end; tip of upper overreaching the lower mandible; nostril small and at edge of feathers. Crown buff with side stripes of black; back mainly black with stripes falling into two middle lines of buff and two outer lines of whitish; neck and breast spotted and streaked with buff, brown and dusky; sides barred with black and white; belly white.

Identification.—The long bill (2½ inches), longitudinally striped head and back, mottled breast, white belly, and dusky rump suffice to separate this bird from any others. Its erratic zigzag flight is ordinarily the most useful field mark.

Occurrence.—A migrant in the park, seen at two localities only: Crater Lake (4,900 feet), August 30, and Paradise Valley (5,500 feet), September 27.

Habits.—The grassy meadows of the Hudsonian Zone on Mount Rainier would seem to be favorable for the jacksnipe during its post-nuptial migration; both our records pertain to this zone. The first snipe noted was flushed at Crater or Mowich Lake by Stanton Warburton, jr. The bird noted at Paradise Valley was frightened from the margin of a tiny creek near a small lake. The snipe followed a rather direct course for some distance, finally dodging off into the woods.

WESTERN SOLITARY SANDPIPER

(*Tringa solitaria cinnamomea*)

Description.—Length about 8 inches; wing about 5 inches. Summer adults have upper parts, including upper tail coverts and two middle tail feathers, dark olive gray, finely specked with buffy or cinnamon brown; outer quills and edge of wing deep black; side of face whitish, streaked with dusky; underparts whitish, streaked with dusky on upper chest and throat; tail barred with whitish. Winter adults have the upper parts more dusky and less olive, and the chest less streaked. In young birds the specking of the back is buffy and the dusky of chest and sides is tinged with buff.

Identification.—The dark color, black wings, and shrill note separate this sandpiper from most others. Distinguished from the spotted sandpiper by larger size, heavily barred (mostly white) outer tail feathers, absence of white bar on wing, absence of rounded dark spots on white underparts, presence of brown streaked or washed area on throat and breast, and habit of frequently raising wings vertically above back.

Occurrence.—A migrant, found in the Hudsonian Zone only, where the margins of pools beneath snow banks, or the shores or surfaces of alpine lakes, afford it satisfactory resting places. Individuals were noted as follows: Cowlitz Divide (5,900 feet), August 3; Summerland (6,000 feet), August 5; Owyhigh Lakes (5,500 feet), August 9–12; Lake Eunice (5,300 feet), September 2; Sunset Park (5,000 feet), September 7–8; St. Andrews Park (5,500 feet), September 9.

Habits.—Day by day, as we go down to the sandy margin of the lake for water, we see the same clear reflections of the range beyond, the same nodding flowers. On one of these occasions there springs from the shore a bird as if from the reflected sky. With graceful pulselike wing beats it flies far up and across the lake in a broad circle, returning often to the spot from which it was startled. And now comes the trait which binds it forever in memory. After a short pause as its toes touch the sand it stretches its wings straight toward the sky, a moment only, as if testing the sounding of the earth on which it alights.

The solitary habits of the bird, its preference for the attractive alpine lake and park country, and the fact that its winter destination is not definitely known, combine to make this sandpiper particularly interesting. On more than one occasion, in foggy weather between altitudes of 5,500 and 6,000 feet, the bird's clear call note, redolent of the mystery of its migration, was heard. Snow banks, thick cloudy weather, difficult topography, darkness even, apparently have no terrors for the solitary sandpiper.

SEMIPALMATED SANDPIPER[1]

(*Ereunetes pusillus*)

Description.—Length about 6 inches, wing about 3¾ inches. Adults in summer have the upper parts dusky and black, streaked with gray and pale buff; chest light gray, finely streaked; chin, belly, and sides white. In winter adults have the upper parts dull gray,

[1] See Shaw, The Condor, vol. 25, p. 109, May, 1923.

obscurely streaked with dusky; under parts white tinged with gray across chest. The young have the back spotted with black, and scalloped and streaked with buff and white; chest tinged with gray; rest of under parts whitish.

Identification.—Small size separates this bird from the western solitary sandpiper; in summer it is easily distinguished from the spotted sandpiper by absence of spotting on the upperparts. Distinguishable only with difficulty from the least sandpiper, which also may occur in the park, the longer bill of the semipalmated being perhaps the best character for this purpose. Field discrimination between the semipalmated and western sandpipers is impracticable, though Allan Brooks says the semipalmated is very distinct in life, the short black bill having none of the downward deflection seen in the western, and the back being grayer. (Condor, vol. 22, 1920, p. 30.) Both semipalmated and western sandpipers have inconspicuous webs between the bases of the front toes.

Occurrence.—A migrant, observed once only, at St. Andrews Park, 5,500 feet, September 9. Specimen taken by Stanton Warburton, jr.

Habits.—The semipalmated has the wanderlust, which seems to be almost inherent in the sandpiper family; and the one taken was alone on the barren mud flat of an alpine glacial lake on Mount Rainier. This observation is of particular interest, for it is the first record for the State of Washington of this northern and eastern shore bird.

SPOTTED SANDPIPER

(*Actitis macularia*)

Description.—Length 7 to 8 inches; wing about 4¼ inches. Adults in summer have entire upper parts bronzy or greenish olive, faintly marked with dusky; underparts white, marked, except on middle of belly, with round spots of dusky; quills dusky, secondaries tipped with white, with a conspicuous white line along the middle of open wing. Winter adults have the white of underparts unspotted. The young are like the winter adults, but are finely barred on wings and back with dusky and buff.

Identification.—The small size, uniform brown upper surface, white streak on wing, and (in spring and summer) sharp rounded blackish spots on white under surface help to distinguish this bird in the field. Differs from the solitary sandpiper in its smaller size, white bar on wing (shown in flight), white sides and white feathers in the angle of the under side of the bird's wing, and in spring and summer adults spotting of whole under surface.

Occurrence.—Likely to be encountered in suitable situations from the park boundaries to 6,000 feet. We have few records: Longmire (2,800 feet), July 14; Reflection Lakes (4,900 feet), July 15–17; junction of Fryingpan Creek and White River (3,700 feet), August 8 and 13. The Mountaineers studied the nesting habits of the bird at Mystic Lake (5,750 feet), August 8.

Habits.—A spotted sandpiper was observed teetering prettily on the wet rocks and mud on a creek margin. Running quickly and yet daintily about, the tread of the bird was so light that no appreciable impression was made in the soft mud. At intervals it stopped to pick up some tiny fly or water beetle along the stream margin or

on the moist rocks. In foraging the same places were covered several times within a few moments. In fact, the spotted sandpiper was noted in the same restricted area on two occasions separated by several days. In all probability an ever-renewing supply of food was furnished by the waters of the creek. The teeter-tail mannerism was much in evidence; and in addition a head jerk was occasionally observed. As the bird fed, a single call note, resembling *kip*, was uttered at intervals. When the bird became somewhat disturbed over our presence it gave a surprise or alarm note, resembling *whoit! whoit!*

A parent spotted sandpiper and her young were seen almost daily in the meadow at Longmire by Dr. A. K. Fisher, August 6 to 8, 1897. The birds were undoubtedly nesting near our camp at Reflection Lakes, July 16 to 22, 1919. The Mountaineers, as reported

FIG. 67.—Spotted sandpiper, Portland, Oreg. (Photograph from life by William L. Finley and H. T. Bohlman)

by Miss Crissie Cameron, J. Belden Richardson, and H. Galbraith, found a nest at Mystic Lake (5,750 feet), August 8. The young were just ready to leave the nest. The location of the nest and character of its surroundings are shown in the photograph. Miss Nancy Emerson Jones, of the Mountaineers, writes: "The mother had settled this one (the young bird) in a little pool of water evidently to drown the ants which covered his feet and legs. She had been pulling off these ants all the way across to the brook, which the little ones later swam while the mother flew across. She hovered the little ones on the edge of the lake for the night, all with their feet in the water."

LITTLE BROWN CRANE

(*Megalornis canadensis canadensis*)

Description.—Size large, length about 35 inches, wing about 17 to 20 inches. Crown and lores naked except for scattered black

bristles; cheeks and jaw well feathered. The adults have the whole plumage gray or light brownish, the wings darker; the cheeks and throat are lighter, sometimes whitish. In the young the head is entirely feathered, the plumage being rusty brown.

Identification.—The large size (the bird standing about 3 feet), long neck, black legs, and general brownish gray coloration without any contrasted markings help identify this bird in the field. In adults the forehead is unfeathered. In flight the neck is held straight out, not drawn in as in herons.

Occurrence.—Included as a bird of the park on the authority of J. B. Flett and D. L. Reaburn (a former superintendent of the park). Reaburn states: "Sandhill cranes and ducks are often seen along the streams and lakes." (Report of the Director of the National Park Service, 1918, p. 154.) The species is in question. It seems probable that the little brown crane rather than the sandhill crane is the one most likely to occur.

CALIFORNIA QUAIL

(*Lophortyx californica californica*)

Description.—Length about 9½ inches; wing about 4½ inches. Adult male with crest black; patch on back of head olive or dark brown, bordered front and sides by black and white lines; upper parts deep smoky brown, with deep buffy or reddish brown stripes along sides of back; throat black, bordered by white; breast bluish gray; belly scaled except for central deep chestnut patch; flanks dark olivaceous or smoky brown, streaked with white. Adult female is deep smoky brown in color; head without black or white markings; belly scaled without chestnut patch or chestnut on sides; sides streaked with white. The young have upper parts grayish brown, feathers of back and wing coverts with dusky and whitish edgings; feathers of nape with faint white shaft streaks and dusky borders; underparts gray, barred with whitish.

Identification.—The smaller size of this bird distinguishes it from the grouse. It is separable from the mountain quail by its smaller size, shorter, blunt-ended topknot, which points forward instead of trailing backward, and by the scaling on the belly; the bobwhite has no crest. The mountain quail and bobwhite have not, so far as we know, been reported from the park, but may later be found to occur.

Occurrence.—Southwesterly in the park between the Nisqually entrance and Longmire (2,700 feet) only.

Habits.—J. B. Flett reports that quail have been seen occasionally over a period of several years in the vicinity of Longmire and below, but says they are not plentiful. One was observed the last of June, 1919, on the Rampart Trail not more than 150 feet from the road. The bird feigned injury, and was probably nesting close at hand.

During the summer, fall, and early winter of 1919, Toll observed a number of quail as follows:

> About the middle of December there was a flock of these quail around the park entrance (Nisqually River gate). I saw a dozen or 20 in the yard of the house at the entrance. The ground was covered with snow and they were eating the seeds of plants projecting above the snow.

During a week or two at that time quail were repeatedly seen at park entrance and at Sunshine Point, which is one-half mile on the road above the entrance. At the latter point (which is wind swept) the ground was free from snow and the quail seemed to stay there more than elsewhere. Presumably the same flock was seen in all cases. Early in summer I saw a single quail on the road between park entrance and Longmire Springs.

J. Hooper Bowles, of Tacoma, estimates that there has been a 90 per cent decrease of these birds during the last 20 years in the Rainier region.

SOOTY GROUSE

(*Dendragapus obscurus fuliginosus*)

Description.—Size of a domestic fowl. Length 15 to 19 inches; wing 7 to 7½ inches. Adult male with upper parts dusky or sooty blackish, finely mottled with gray and brown, buffy brown on wings; hinder scapulars usually with distinct shaft streaks and terminal spots of white; tail blackish with narrow bluish gray terminal band; under parts slaty. The adult female is similar to the male, but with upper parts, chest, and sides barred and mottled with dark brown, sometimes washed with dark rusty. The young are darker and more rusty.

Identification.—The lack of white in the plumage distinguishes the sooty grouse from the ptarmigan, and its large size, darker, bluer color, and absence of the conspicuous ruff of black or deep brown feathers on either side of the neck separates it from the Oregon ruffed grouse.

Occurrence.—In the Hudsonian Zone, principally between 4,900 and 6,000 feet.

Habits.—The sooty grouse was most often found on backbone ridges, where food and shelter were present in abundance. Flushing with a thundering whirr of wings at our approach, it would fly downhill, rocking from side to side as it went, until a safe haven was gained within the branches of some conifer a few hundred feet below. Its dark color, blending with the heavy green foliage of fir and hemlock, serves well to conceal the bird from even a keen-sighted enemy. Droppings or dusting places sometimes indicated the presence of the grouse in a locality where the birds themselves were not seen. The clumps of alpine fir and mountain hemlock, often matting out close to the ground as if to escape the furious winds which occasionally sweep the heights, afford the bird excellent shelter.

Grouse taken August 10, 1897, on a trip from Indian Henrys to O. D. Allen's place (3 miles east of Ashford) had their crops full of huckleberries. Those taken higher up had been feeding on the flowers of *Polygonum bistortoides* and *Agoseris* sp. The crops of birds shot at timber line contained mountain ash leaves, grasshoppers, and ants.

On more than one occasion was heard their romantic hooting or booming. On July 12 an old male, evidently from an airy perch in a conifer clump on Mount Ararat Ridge, called over and over again, *whoot!!!! whoot!!! whoot!! whoot!* On August 11 another bird at Owyhigh Lakes was heard hooting throughout the day. This endurance hooting is regarded by some residents as a sign of

rain. Dr. A. K. Fisher, while encamped in Paradise Park in 1897, heard the birds "booming" every day from July 28 to August 5.

The nest is a slight depression alongside a log or under grass or bushes, lightly lined with pine needles and grass. The eggs are 8 to 15 in number, and are cream or creamy buff, spotted with brown over the entire surface. The first young birds were seen July 28 on Mount Ararat, where a parent and eight newly-hatched chicks were observed by the Mountaineers. This was the largest number of chicks seen. Evidently as the season advanced, accident, disease, and marauding animals took toll of the broods, for during September the family groups observed contained but two or three young. Six or seven chicks observed on Cowlitz Ridge on August 2 were already able to fly, and young noted in September were fully grown or nearly so.

Parents and young were observed on several occasions in Paradise Valley late in September. The mother of one group, having been

FIG. 68.—Nest and eggs of sooty grouse. (Photograph by A. H. Barnes, National Park Service)

flushed, flew across a shallow ravine to a log beneath a tree, while her two young remained perched in a mountain ash on the opposite side. The solicitous parent seemed almost devoid of fear, making herself conspicuous on the log, and even allowing the observer to approach to within 6 feet. Through all this time of grouse anxiety, mother and young kept up a reassuring clucking back and forth.

During a snowstorm which took place on September 27 an adult and three full-grown young were noted taking cool comfort in the shelter of a small alpine fir by a little lake. They appeared to have given up any idea of foraging or other activity, but were moping about, tails down, with an air of resignation which was very comical.

OREGON RUFFED GROUSE

(Bonasa umbellus sabini)

Description.—Length 15 to 19 inches; wing 7 to 7½ inches. The adult male has conspicuous black ruffs on either side of neck; upper parts black and dark rusty or reddish brown, rarely with any gray;

tail usually deep rusty, rarely grayish, with broad black subterminal band, underparts heavily marked with blackish and washed with buffy brown. The adult female is similar but smaller, with neck tufts rudimentary or obsolete. The young are similar to the adult female, but are browner, barring paler and less distinct, and neck tufts wanting.

Identification.—The ruffed grouse is somewhat smaller than the sooty grouse. Its reddish brown coloration, the dark band near end of tail, and the conspicuous ruffs of black or deep brown feathers on either side of neck (most conspicuous in males) are distinctive features.

Occurrence.—In Transition Zone usually below 3,000 feet.

Habits.—The ruffed grouse, miscalled pheasant, while not numerous or broadly distributed in the park, is one of its handsomest and most attractive game birds.

A mother bird was flushed in the brakes of Maple Creek near its junction with Stevens Creek on July 23. Shortly afterwards four shy youngsters, about the size of quail, were scared up, and, like the mother, flew into a tree. As we passed the parent stood conspicuous, successfully diverting our attention from the young. A little later a female and one young bird were noted in the tangled vegetation near Canyon Bridge on the Muddy Fork of the Cowlitz River. Probably several other young were safely concealed in the shelter of near-by thickets.

A single individual, probably a cock, was flushed from a patch of alder brush in the burn near Nickel Creek. It thundered off down the hill, clucking excitedly and rocking from side to side as it went.

Dr. C. Hart Merriam (MS.) reports the birds common in the Nisqually Valley August 2 to 15, 1897. Between these dates he saw young hardly more than half grown. The stomachs of some of them contained wintergreen berries and mushrooms.

Three birds were noted October 6 near the park boundary south of Longmire, altitude about 2,600 feet.

This bird is not a conspicuous resident of the park as defined at present. The addition to the park of a strip of territory south and west, so urgently needed for the proper protection of the deer, would incidentally favor the increase of the ruffed grouse. The desirability of this is indicated when it is remembered that a considerable decrease in the number of these birds, estimated by a competent observer at 90 per cent, has taken place in the Rainier region during the last 25 years.

RAINIER WHITE-TAILED PTARMIGAN

(*Lagopus leucurus rainierensis*)

Description.—About the size of a domesticated bantam fowl. Length about 13 or 14 inches; wing about 7 or 7½ inches. Adults in winter are pure white. In summer their plumage is spotted, barred, or mottled with black and pale buffy brown except the white wings, tail, legs, and belly; the white tail is hidden from above by long, mottled coverts. The female in summer has more extensive black mottling or barring on belly and flanks than the male, the net result being that she is more protectively colored. In the fall the dark

parts in both sexes are more uniformly grayish brown and markings more delicately penciled. Young have the tail gray.

Identification.—Distinguished from the sooty grouse by the presence of white in all stages of plumage. The ptarmigan is found characteristically on slopes above timber line, while the sooty grouse seldom or never ventures above the limit of trees.

Occurrence.—In the Arctic-Alpine Zone all around the mountain, rarely dropping down into upper Hudsonian, except in winter. Altitude range, from 6,000 to 8,000 feet.

Habits.—The ptarmigan finds congenial surroundings on the pumice slopes at and above timber line on Mount Rainier. Here the combination of bright light, freezing boreal blasts, dwarfed and

FIG. 69.—Female ptarmigan at nest, Pyramid Peak. (Photograph from life by William L. and Irene Finley)

wind-blown vegetation, and extensive snow and ice fields provide Arctic conditions in fact.

The presence of ptarmigan, when the birds themselves are not seen, is frequently indicated to the practiced eye by the telltale feathers, by dusting places in the pumice sand, and by the droppings, which possess a characteristic form and appearance.

A nest with eggs was discovered on July 10 by J. W. Hungate near Indian Henrys Hunting Ground. Two days later we climbed to the nest site for the purpose of getting photographs of the bird. As we toiled up the slope a male flew rapidly by us and was seen no more. Consciously or unconsciously the ptarmigan had here selected a nest site which for grandeur of outlook would be hard to equal. The nest was on the ground on the south side of a rock on a southwest

slope of Pyramid Peak, at an altitude of about 6,100 feet, where the hardy conifers, dwarfed and matted in their unequal struggles with the elements, had at length given up completely. At first glance the nest did not appear to have been specially constructed; but it was later found that a hollow had been excavated and filled with dried vegetation. The nest itself was comfortably dry, though the soil below was damp, and doubtless usually frozen solid. A few feathers were scattered about the nest. Plants in the immediate vicinity were the red and white heathers and the Siberian juniper. There were five eggs, one infertile, one addled, and three in various stages up to approximately 10 days' development.

In 10 minutes after we reached the Pyramid Peak nest the female had returned. She proved a willing subject for observation. After

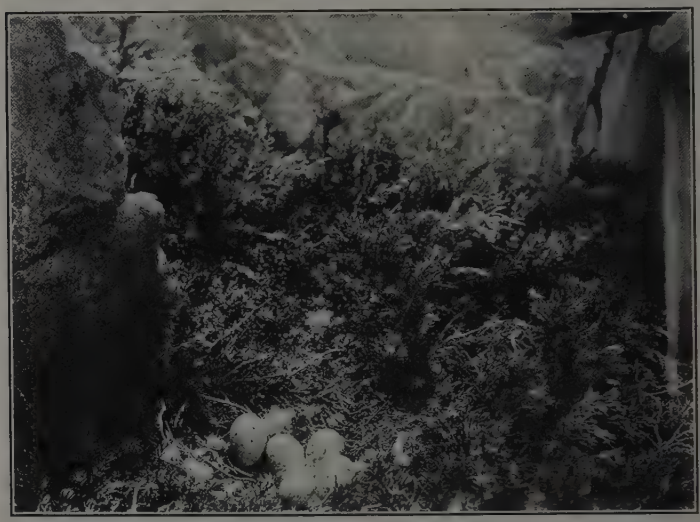

FIG. 70.—Close-up of ptarmigan nest, Pyramid Peak. Note the simplicity of the structure; the feathers; the sheltering rock; the Siberian juniper about the nest; the handsome spotted eggs. (Photograph by J. B. Flett, National Park Service)

several hours' attention from six persons and four cameras, she finally became so reconciled to human society as to permit Mrs. Finley, and later the children, to smooth her feathers and otherwise fondle her.

While on the nest she several times uttered a *hoot, hoot, hoot, hoot, hoot*, a low, almost inaudible, soothing series of grouse-like notes. Another note uttered by the ptarmigan as she turned the eggs was a *cluck! cluck!* much resembling the call of a barnyard fowl to her little chickens. When away from the nest she stalked about rather slowly, occasionally jerking back her head in a characteristic manner, and regarded with evident anxiety the nest site about which we were grouped. If we approached the nest too closely the gentle bird was not a little perturbed and warned us *perrt! perrt!* or sometimes *pit-prrrrt! prrrrt!*

A furtive sneaking run, much like that of the ruffed grouse and certain other fowl-like birds, was not infrequent. Once we watched her perform a partial toilet. She seemed to enjoy stretching her cramped wings and legs, spreading her tail, and scratching her head with her foot. We were particularly interested when, in our presence, she condescended to lunch upon the delicate bells of the white heather (*Cassiope mertensiana*). These she picked off with a quick, nervous movement. On returning to the nest she always turned the eggs, and in a moment settled down very comfortably upon them. The afternoon was only moderately warm, but the bird, dressed for the freezing climate of timber line, appeared to be panting with the heat.

FIG. 71.—Female ptarmigan on nest, Pyramid Peak. Note lack of shyness of bird and the high degree of protective coloration. (Photograph from life by William L. and Irene Finley)

Later in the season two other nest sites were discovered, one above Paradise Valley near McClure Rock, at an altitude of 7,300 feet, the other (reported by J. B. Flett) on the high ridge between St. Andrews Park and North Tahoma Glacier at 6,200 feet. The shells of from four to seven eggs, found in the vicinity of each nest, indicated that domestic duties were for some time past. Both nests were on south slopes. One was placed in the shelter of a large bowlder; the other on the open, bare ground, having no protection except its coloration. However, in its setting of whitish sand, speckled rocks, and variously colored sticks the nest was inconspicuous.

On August 8, 1897, Dr. C. Hart Merriam found a nest of four old eggs a little above 8,000 feet in the Paradise Park region. The nest was in a bed of green heather (*Phyllodoce glanduliflorum*) in a

narrow place between two rocks, and was made by simply molding the heather into a small, shallow cup, just large enough to hold the four eggs, and without any other lining whatever save a few feathers from the parent bird. Red heather, phlox, sedge, and the tiny Lyall lupine were the principal plants in the vicinity.

On July 19 a pair of ptarmigan were found on a steep slope between two talus rock slides on the jagged Tatoosh Range near Pinnacle Peak. One of the birds, a cock, remained in the vicinity for upward of an hour, watching the observer and calling for his mate. His principal call was something like *Su-squeek! cluck-luck-a-luck, cluck-luck-a-luck!* or sometimes *Squeek! cluck! cluck! cluck! cluck! cluck! Cluck lucka-lucka-lucka-cluck!* Occasionally the call is blurred at the end, *Cluckrrrrrrrr!* The squeaking note, which is of staccato quality, high pitched and conspicuous, may be twice repeated, as follows: *Squeek! chuck chuck chuck chuck chuck chuck chuck Squeek! chuck chuck chuck!* A call somewhat resembling that of the red-shafted flicker was heard *yip! yip! yip! yip!* Another combination *Yip, yip Squeech! yip! yip!* A warning note may be represented by the syllable *chirr chirr chirr chirr chirr chirr.*

The Pinnacle Peak bird was not in the least shy, walking about on the rock slides or the steep slopes between within easy observing distance. Another bird, apparently a cock, answered his call at least once from a considerable distance. The wing whirr of the ptarmigan in flight reminds one of that of a sooty grouse; but whereas the grouse flushes at comparatively long range with a thunderous commotion, the ptarmigan usually permits close approach, taking several steps if pressed too hard, and only taking wing as a last resort.

Items in the ptarmigan bill of fare were the leaves and flowers of the little alpine buckwheat (*Eriogonum pyrolæfolium coryphæum*); leaves of the tiny Lyall lupine (*Lupinus lyallii*), and red and white heather (*Phyllodoce empetriformis* and *Cassiope mertensiana*).

Two pairs of ptarmigan in high summer plumage were encountered August 5 on the ridge above Panhandle Gap. The birds were tamer than the average barnyard fowl, it being comparatively easy to approach to within 4 feet of them. They were seen eating two kinds of grass. One of the cocks was evidently of a jealous temperament, and on several occasions prevented the securing of pictures by his persistent attempts to drive away the other cock. Later in the day the aggressor was observed in undisputed possession of both the hens! The altercation between the cocks seemed to occupy their minds to the exclusion of all beside, for they were much more concerned about each other than they were about the two men who so persistently followed them. The birds kept together fairly well. They were much more conspicuous, and wary, too, on the snow than in the heather and rocks. They evidently preferred to forage in a rather limited area of grass, rocks, and snow banks.

The "freezing" habit is characteristic of ptarmigan and must be of the highest importance as a protection from enemies. Repeatedly we were startled to find that we had for some time been looking directly at birds which we had not discerned, so quietly did they stand on the rocks, and so harmoniously did their coloration blend

with that of their surroundings. There seems to exist in ptarmigan a marvelous correlation between need for protection and degree of concealing coloration, for the young are best protected by their coloration, the hens next, the cocks least.

The birds have an interesting habit of exposing at intervals the naked red skin above the eye. The purpose of this we did not discover.

Young birds were first seen on July 29 on the slopes of Pyramid Peak. The activities of the mother and four young observed at this time are well described by Mrs. D. A. Thornburg, of the Mountaineers' Club, as follows:

> The mother ptarmigan and her brood were discovered on the climb of Pyramid Mountain the day after we reached Indian Henrys, July 28, 1919. Feeling that the birds would be more interesting than the climb, I stayed behind and let the party go on to the top. I was repaid by the most interesting hour of the whole summer trip. On my first approach the mother watched me until I got within about 10 feet of her, when she uttered her warning — threatening to fly at me if I came nearer. The chicks feeding close about her feet at once "froze"—one with his head down, after a bug; one with his body stretched up to reach something on a bit of heather. It was very amusing. They stayed exactly as they were at her first note and held the pose for it seemed a minute until the mother gave a satisfied little cluck; then they went on with their feeding, none of them either before or after the alarm paying the slightest attention to me, seeming to depend utterly on the mother's watchfulness. I sat down quietly where I was, and in a short time the mother seemed satisfied that there was no danger.

Dr. A. K. Fisher found ptarmigan quite common in 1897 in Paradise Park near timber line, where, on July 29, an old one and her young were found on one of the bare patches about 500 feet above timber line. On August 2 he saw two with their young above timber line, near the same glacier. One of the old birds would fly about him so that he nearly stepped on her several times as he chased one of the young. The stomachs of the young contained beetles, the flowers of heather (*Cassiope mertensiana*), and those of a small blueberry.

Although protected from persecution by man, the young ptarmigan must run the gauntlet of exposure, sometimes food shortage, accident, and carnivorous enemies. The sad fate of many of the downy chicks is all too clearly demonstrated by the observed decrease in the size of some of the broods with the advance of the season. A mother and four or six young were seen at the Palisades on the north side of the park August 16. On the same day a parent and two young were observed at Marcus Peak. On August 18 J. B. Flett saw two groups of ptarmigan on Burroughs Mountain near Glacier Basin, one a parent and five young, the other a parent and three. These young were not more than one-quarter grown. We were told that a certain ptarmigan, observed at Glacier Basin, had been seen first with six young, then with four, and latterly with three.

A ptarmigan was noticed near a snow bank on Burroughs Mountain August 22. The bird was approached to within 4 feet when two others were seen on near-by rocks, all standing motionless, observing the intruder. Before long seven birds were in full view. These birds were practically full grown. Like others previously mentioned, the ptarmigan were much shyer upon the snow fields, where their mottled summer plumage made them conspicuous, than

upon the rocks. H. M. Albright, superintendent of Yellowstone Park, says when ptarmigan are in white winter plumage they try to stay on the snow fields, where they are inconspicuous, avoiding the rocky exposed ground so far as they are able.

Dr. C. Hart Merriam is of the opinion that the flesh of the ptarmigan, which is dark, is the finest of all the grouse, the ruffed grouse coming next and the blue grouse last.

Concerning the winter habits of the ptarmigan on Mount Rainier little is known. J. B. Flett, during the fall of 1919, found the track of a bird he took to be ptarmigan under a cliff at McClure Rock, altitude 7,300 feet. Probably the Siberian juniper, mats of which are common on the rocks, furnishes a large part of the bird's food

FIG. 72.—Mother ptarmigan with seven young on snow bank, Mount Rainier. (Photograph from National Park Service)

at this time. Flett reports that usually the ptarmigan descend in winter and are found below the terminal moraines of glaciers, though occasionally they winter under cliffs at timber line.

BAND-TAILED PIGEON; WILD PIGEON

(*Chloroenas fasciata fasciata*)

Description.—About the size of an ordinary domesticated pigeon. Length 15 to 16 inches; wing 8 to 9 inches. End of tail of adult male with broad band, 2 inches wide, pale gray bordered above by black; back of neck with white collar adjoined by iridescent bronze patch spreading back as a greenish wash; head and underparts purplish pink, fading to whitish on belly; forepart of back tinged with brownish, hinderpart bluish gray; wing quills blackish, coverts bluish gray, faintly edged with white. The adult female is like the

male but is duller and grayer; the white nuchal band is often obsolete, the iridescent patch is restricted, the head grayish instead of pink, underparts largely grayish. The young are without white on nape, have the underparts dull grayish, and are tinged with brown on the breast; upper parts with feathers more or less lightly bordered with paler; head and neck dull bluish gray in male, light grayish brown in female.

Identification.—The size, general bluish coloration, distinct dark band across middle of square tail, and wings without white patches identify this bird.

Occurrence.—Summer resident in the park at altitudes below 3,000 feet; also a migrant, likely to be encountered at the proper seasons at almost any altitude up to timber line.

FIG. 73.—Band-tailed pigeon, Corvallis, Oreg. This bird is related to the ill-fated passenger pigeon. Each pair of the birds, as a rule, raises but one young each year. (Photograph from life by O. J. Murie, Biological Survey)

Habits.—Had not scientists discovered that our domestic doves are derived from the rock dove of Europe, we might have supposed that they were descended from our own wild pigeon, for this bird is very like the common blue rock of the eaves not only in color and general body form but also in some of its habits of flight.

While in summer the wild pigeon is found from southwestern British Columbia southward in the coast region to California, in winter all the Pacific coast birds from north of California migrate southward into the west-central and southern part of that State, which, therefore, in winter, so far as the Pacific coast region is concerned, is responsible for the existence of the species. (See Grinnell, Bryant, and Storer, Game Birds of California, 1918, p. 579.) During the winter season they often concentrate where acorns, berries, or other food is plentiful, and in arid parts of their range

they assemble in large numbers at certain water holes during the earlier part of the day. These flocking tendencies are frequently to their disadvantage, especially during the hunting season. Similar habits were a large factor in the ultimate extermination of the passenger pigeon, but fortunately, unlike the latter, the band-tailed pigeon does not nest in colonies.

Another peculiarity which militates against the survival of the bird is its slow rate of reproduction. "As a rule but one young is hatched each year. Contrast this with 10 among quail, 8 among ducks, and 4 among wading birds. The impressive fact that our wild pigeon does not exceed in rate of reproduction the birth rate of deer, antelope, and elk suggests the demand for treatment in game legislation corresponding with that given these large mammals." (Grinnell, Bryant, and Storer, op. cit., p. 583.)

The wild pigeon is doubtless a summer resident at least in the lower portions of the park. A company of five were observed on July 30 at Ohanapecosh Hot Springs (2,000 feet) feeding on blue elderberries. Dr. A. K. Fisher reported that pigeons came daily to the springs at Longmire, August 6 to 8, 1897; and J. B. Flett asserts that the birds are to be seen at this locality throughout the summer season.

On September 7, while encamped at Sunset Park (5,500 feet), we observed several flocks flying southward overhead. The companies averaged perhaps 16 to 18 birds, and one at least contained 25. Altogether more than 100 birds were counted on this date. Some of these were flying at 7,000 feet altitude at least. (Warburton MS.) Pigeons were noted at the same locality on the two following days also; and at St. Andrews Park on September 15 a flock of 10 passed overhead, others being noted later. One bird was seen flying south at 4,000 feet altitude on Mount Wow on September 20.

MARSH HAWK

(*Circus cyaneus hudsonius*)

Description.—Length 19 to 24 inches; wing 12½ to 16 inches. Face encircled by an owl-like ruff of short feathers. The adult male has the body bluish slate, streaked with white and becoming pure white on rump and belly; under parts lightly specked with reddish brown; tail with 6 or 8 bands, one nearest end widest and blackest; wings black tipped. The adult female and young are brownish or rusty in coloration, more or less streaked.

Identification.—The slender build, facial ruff, and white rump readily identify this hawk in any plumage.

Occurrence.—Probably found occasionally as a migrant after nesting. Our records are for St. Andrews Park.

Habits.—What was our surprise, while climbing at timber line, altitude about 6,000 feet, on the high ridge between St. Andrews Park and North Tahoma Glacier, on September 13, to note a marsh hawk flying about with characteristic gliding flight. The age of this bird was not apparent; but it is not unlikely that it was a young hawk taking part in the scattering movement after the breeding season which is so conspicuous a phenomenon with many birds.

An individual, probably the same bird, was observed on the same date flying south over St. Andrews Park, 5,500 feet.

The marsh hawk is known also as the mouse hawk and is a moderately common nester in the Puget Sound country, as well as east of the Cascade Mountains.

SHARP-SHINNED HAWK

(*Accipiter velox*)

Description.—A small hawk, the male 10 to 11½ inches long, wings 6$^{1}/_{10}$ to 7$^{1}/_{10}$ inches; the female 12½ to 14 inches long, wing 7⅘ to 8⅘ inches. The upper parts of the adult male are nearly uniform bluish gray; underparts white, heavily barred and spotted with reddish brown; tail even or slightly notched, with 3 or 4 narrow blackish bands and narrow white tip. The adult female is similar but duller, less blue above, less reddish below. In the young the breast markings are vertical instead of horizontal. Upper parts of young dark brown, edged with rusty and with hints of white spotting; underparts white, often tinged with buffy, streaked vertically with brown; sides and flanks barred with reddish brown.

Identification.—The small head, long legs and tail, and short wings indicate the genus *Accipiter*. The banded tail of the sharp-shin separates it from the male sparrow hawk, which is not far removed in size, and the proportionally short wings and absence of black facial markings distinguish it from the female. It is sometimes difficult to discriminate between the sharp-shinned hawk and Cooper hawk, particularly if an overgrown young sharp-skin is compared with a male Cooper. The sharp-shinned hawk possesses an even tail, comparatively straight across the end, while the Cooper hawk has the tail rounded. Furthermore, the sharp-shinned hawk is usually distinctly smaller than the Cooper.

Occurrence.—From park boundaries to timber line.

Habits.—This is a small and very active hawk, which is responsible for the death of many a song bird, as well as of some of the game birds, and, in settled communities, of small chickens. Undoubtedly the sharp-shinned hawk, along with the Cooper and goshawk, bring disrepute on the entire hawk and owl tribe, though most members of the family are beneficial through their destruction of injurious rodents and insects.

The sharp-shin is solitary in habit and a skulker in the bargin, often appearing when least expected. Flying low, it passes like a flash, surprising many a flock of finches feeding in the bushes or on the ground.

Sharp-shinned hawks were numerous on the northwest side of the park. One overgrown young one was apparently attracted by a squeaking sound made by the observer, or perhaps was following the flock of juncos which had responded to the squeaking. The evident abundance of these hawks in Sunset and Spray Parks late in the season may have been the result of a partial migration from the lowlands after nesting.

On August 2, 1897, Dr. A. K. Fisher saw one sharp-shinned hawk near Stevens Glacier and another at timber line about a mile east of the Nisqually Glacier. Attention was attracted to the first by a sparrow hawk which kept darting at it.

COOPER HAWK[1]

(*Accipiter cooperii*)

Description.—Somewhat larger than the sharp-shinned hawk; the male 14 to 17 inches long, wing 8¾ to 9½ inches; the female 18 to 20 inches long, wing 10 to 11 inches. As a rule the female among hawks is a larger, heavier, and stronger appearing bird than the male. The Cooper hawk, as the measurements indicate, is no exception. The adult male has under parts white, heavily spotted and barred with reddish brown; top of head black contrasted with bluish gray of back; tail rounded, with three or four black bands and narrow white tip. The adult female has the upper parts duller and less bluish than in the male; the top of head more brownish black; hind neck and sides of head washed with dull rusty. In the young the upper parts are dark brown, with rusty edgings and suggestion of white spotting; the underparts are streaked vertically.

Identification.—See remarks on identification under the sharp-shinned hawk (p. 149). Size of the bird and the shape of its tail are probably the best field characters for separating the Cooper and sharp-shinned hawks.

Occurrence.—From park boundaries to timber line, all around the mountain.

Habits.—A relentless tyrant and murderer of small birds, the Cooper hawk must be classed as an avian outlaw. When control measures directed at noxious hawks are planned, however, great care should be taken to avoid destruction of the beneficial species along with the harmful. Enough is known of the food habits of hawks in general to warrant careful discrimination. Better let all bird-killing hawks live than to destroy the innocent with the guilty.

The Cooper hawk is often observed perching upon the dead top of a conifer, but it is too restless and active to remain long in such a position. More frequently it is seen patrolling swiftly among the clumps of trees where large flocks of migrating robins or warblers are congregated; in fact, the numbers of these hawks observed in a locality is generally in proportion to the number of small birds. More Cooper hawks were observed in Sunset Park than at any other locality on the mountain; and it is probably not a coincidence that small birds, too, were more numerous here than elsewhere.

A male Cooper hawk was frightened from a clump of alder brush at Owyhigh Lakes. It flew swiftly for a short distance and dived into the brush on the sidehill a little farther on. As it passed a chorus of alarm notes in different pitches and keys arose from all the conies, siskins, chipmunks, and juncos in range.

WESTERN GOSHAWK

(*Astur atricapillus striatulus*)

Description.—Size large; male 20 to 22 inches in length, wing 12 to 13¼ inches; female 22 to 24½ inches, wing 13½ to 14¼ inches.

[1] Named in honor of William Cooper (1798–1864), one of the most prominent of the earlier New York naturalists, an "original member" of the New York Lyceum of Natural History, now the New York Academy of Sciences, and an active scientific worker throughout his life.

Upper parts of adults of either sex are dark bluish gray to sooty black; underparts dark gray, heavily mottled with finely penciled gray zigzags, touched up with dark shaft streaks; belly and thighs barred; tail bluish gray, more or less tipped with white and crossed by about four dusky bands, sometimes obsolete on the upper surface. The young have upper parts brownish black, with buffy and rusty streakings and edgings; underparts buffy with broad lengthwise streaks of deep black.

Identification. The more slender outlines and longer legs and tail of this hawk separate it from the western redtail and Swainson hawks; the general color of adults gives an impression of bluish or bluish gray, darker above, paler beneath; there is also a prominent white line over the eye; young birds are usually more heavily streaked beneath. The goshawk is a fast flying skulker, characteristically a bird of the woods, while the Swainson and redtail hawks prefer open country.

Occurrence. Uncertain. Perhaps a summer resident, but more probably a migrant and winter visitant.

Habits.- Bailey asserts that game birds and poultry suffer more from the goshawk than from any other, and that its rapid flight, size, strength, and daring combine to make it the most destructive of American birds of prey. (Handbook of Birds of the Western United States, 1917, p. 153.) Since its food is especially made up of valuable game birds, such as sooty and ruffed grouse, it is perhaps well that the bird is not abundant in Rainier Park.

Some winters witness the influx into the United States from the north of unusually large numbers of goshawks, probably due to shortage of food. At such times it is altogether likely that the game birds in the park suffer with those of other localities.

Our actual records of the bird are two in number; one was observed August 11 at Ohanapecosh Hot Springs (2,000 feet) at the extreme southeast corner of the park, and another at Spray Park (5,500 feet), August 27.

WESTERN RED-TAILED HAWK

(*Buteo borealis calurus*)

Description. One of the larger hawks; male 19 to 22½ inches long, wing 13½ to 16½ inches; female 23 to 25 inches long, tail 15¼ to 17¾ inches. The adults vary greatly in plumage. In the light extreme the underparts are white or buffy, with broad reddish brown streakings on throat, belly, and sides; tail bright reddish brown, with one or more subterminal blackish bars; rest of upper parts dark brown, more or less marked with yellowish brown and whitish. In the dark extreme the entire plumage is uniform dark sooty brown except for the rufous tail. Intermediates are reddish brown beneath, and with more or less reddish brown wash on upper parts; and there are all grades of plumage between the light and dark extremes. The young have the tail grayish brown, varying to dull yellowish brown, crossed by 9 to 10 blackish bands; rest of plumage dark brown heavily spotted beneath, sometimes wholly dusky.

Identification. The genus *Buteo*, to which the western redtail and the Swainson hawks belong, is made up of heavy appearing birds

having wings longer than tail. The fan-shaped red tail is the best field character of the present species. In the absence of this it is ordinarily impracticable to distinguish this bird from the Swainson hawk, except when the latter is in typical adult plumage (which, unfortunately, is not often), with reddish brown chest band strongly contrasting with white of throat.

Occurrence.—Park boundaries to timber line; principally observed, however, in the Hudsonian Zone, between 4,500 and 6,500 feet.

Habits.—The western redtail is one of the big hawks of the upper air. On strong wings he sails forth over deep canyons, dropping for a moment, perhaps, below the horizon line and appearing against the green of the forest-covered landscape. The red-brown tail stands out strongly in contrast to the dark background. Soon with ponderous wing strokes he rises; up, up, against the sky and presently contents himself with soaring on what seem to us at this distance motionless wings.

Occasionally two redtails are seen over the same canyon. Now and then one of them will fold his wings and drop rapidly downward, apparently in a playful pass upon his companion in the air below, suddenly arresting his momentum in a great sweeping curve which sends him shooting high into the air again.

If one approaches the redtail's nest, usually located in some tall tree, the bird will show much concern and fly in circles through the air, uttering piercing screams.

Immature birds were commonly observed at Sunset Park early in September, where they appeared to be migrating. Whether they had come up from the lowlands on a wave of vertical migration or were part of an irregular movement north to south could not be determined.

The stomach of one redtail examined contained a red-backed mouse. A large-footed meadow mouse was found in that of another. That the bird prefers mice and other mammals to almost any other article of diet is made certain by the studies of the Biological Survey, United States Department of Agriculture. All too often, however, this big hawk suffers for the record of his bird-killing cousins, the Cooper hawk, sharp-shinned hawk, and goshawk. As one of man's best friends among birds he deserves careful protection.

SWAINSON HAWK[2]

(*Buteo swainsoni*)

Description.—Slightly smaller than the redtail; the male 19½ to 20 inches in length, wing 14½ to 16 inches; the female 21 to 22 inches long, wing 14¾ to 17¼ inches. The adult male in normal plumage has throat and belly white, white of throat sharply contrasted with reddish brown chest band; upper parts nearly uniform dark grayish brown; tail crossed by about 9 or 10 narrow blackish bands. The adult female in normal plumage is like the male, but has the chest patch grayish brown instead of rufous. In a black, or melanistic, phase of plumage, both sexes have the whole plumage a

[2] Named in honor of William Swainson (1789–1855), an English naturalist. He was born at Liverpool, and made valuable collections of objects in natural history in South America and on the shores of the Mediterranean. He emigrated to New Zealand in 1841.

uniform sooty brown, with under tail coverts sometimes spotted or barred with rusty or whitish. All stages of transition between the light-colored normal plumage and the black phase are shown by different individuals. Young birds have upper parts blackish brown varied with buffy or yellowish brown; head, neck, and underparts buffy brown, head and neck streaked with blackish; underparts usually more or less blotched with blackish.

Identification.—In normal plumage the adult Swainson hawk can be told by the dark breastband sharply contrasted with the white of the throat. It is usually impracticable to identify the species in the field when in immature or transitional plumage.

Occurrence.—Principally in the Hudsonian Zone (4,500 to 6,500 feet) all around the mountain.

Habits.—The Swainson hawk is one of the most active, noisy, and abundant of the larger hawks in the park. On August 22 four were observed poising, circling, and playfully pursuing one another above and before a cliff at the south end of Grand Park. The cliff had evidently furnished a location for the nest, and a capital site it was, with a wilderness of canyon, forest, and alpine park spread before and the dominating dome of Rainier himself not far distant.

John Burroughs has said: "To strong, susceptible characters the music of nature is not confined to sweet sounds." (Birds and Poets, 1878, p. 12.) And with "* * * the wild whinney of the loon, the whooping of the crane, the booming of the bittern, the vulpine bark of the eagle," and "the loud trumpeting of the migratory geese" he in all propriety includes the "defiant scream of the hawk circling aloft." The call notes of hawks are wild music of unique attractiveness. To the real lover of nature they suggest fine days in the open, where the healing ministry of the great outdoors excludes the petty cares of civilization.

One call of the Swainson hawk was set down as a loud *squeeuk!* Another call note closely resembles the *peear!* of the western redtail. The loud scream-call is often followed by a series of strongly whistled syllables resembling *tsip! tsip! tsip! tsip!*

This hawk's food is chiefly mice or other mammals and insects; occasionally, but not often, a bird is included in its dietary. The stomach of a Swainson hawk taken at Reflection Lakes contained a large-footed meadow mouse; a hawk secured at Sunset Park had just eaten a red-backed mouse.

More of these hawks were observed in the arid and desolate Yakima Park country northeast of Mount Rainier than anywhere else in the park. Insects were fairly abundant in this region, which may in part account for the concentration there of Swainson and sparrow hawks.

Like the redtail, the Swainson hawk, while deserving protection, is often punished for the misdeeds of others. Even out-of-doors people frequently do not distinguish between the goshawk, which is a game killer, and the Swainson hawk, which kills little or no game. Is it not reasonable to insist that those who wish to increase the game supply by killing the enemies of game should first learn to distinguish these enemies from neutrals or allies?

FIG. 74.—Golden eagle, Warm Springs, Calif. Note that the legs are feathered to the toes. (Photograph from life by William L. Finley and H. T. Bohlman)

GOLDEN EAGLE

(*Aquila chrysaëtos*)

Description.—A bird of great size, robust form, and powerful physique; length of males 30 to 35 inches, wing 23 to 25 inches, wing spread 6½ to 7 feet; females are a trifle larger, 35 to 40 inches long, wing 25 to 27 inches, wing spread 7 to 7½ feet. The sexes are alike in color. Adults are dark brown, feathers of the hind neck and legs lighter; wing quills black; tail blackish, more or less clouded or irregularly banded with grayish. The young resemble the adults, but have the basal part of the tail plain white, and underparts white beneath the surface.

Identification.—The large size, robust form, and uniform dark-brown color of this monarch among birds usually permit easy identification. From the adult bald eagle it is separated by its dark-brown head. Field separation of the golden eagle from immature stages of the bald eagle is impracticable, for the young of the latter during their first year closely resemble the former. In hand the eagles can always be separated by characters of the legs, the golden eagle having the legs feathered all around to the toes, the bald having the lower leg feathered halfway down only.

Occurrence.—In the Hudsonian Zone only, at or above 5,500 feet.

Habits.—The golden eagle is among the largest of the birds of prey. It is abundant in the interior of the continent, in contrast to the bald eagle, which is more common along the seacoast.

The bird is a powerful flyer, and it is an inspiring sight to watch it soaring among the cliffs. Frequently one sees it maneuvering over the headwaters of a mountain stream, above the land of the marmot and the cony. The placid dignity of the great bird at such times is in reality an ever alert watchfulness. From side to side it tilts, swinging its great head now this way, now that. Suddenly with wings partially folded it makes a nose dive. Like a meteor it shoots earthward amid the piercing whistles of ever watchful marmots. Unfortunate, indeed, is the cony who has ventured too far from its rocky shelter.

Dr. C. Hart Merriam observed one or two golden eagles in the vicinity of timber line, Paradise Park, every day, August 2 to 5, 1897. We sighted the huge birds in 1919 in similar localities at intervals all around the mountain.

BALD EAGLE

(*Haliaeetus leucocephalus leucocephalus*)

Description.—Size large; male 30 to 35 inches long, wing 20 to 26 inches, wing spread about 7 feet; female 34 to 43 inches in length, wing 23½ to 28 inches, wing spread 7 to 8 feet. Adults have head, neck, tail, and tail coverts snowy white, the rest of the plumage blackish or dark brownish, feathers edged with brown. The young are wholly black during the first year except for the white bases of feathers showing through; second or third year, underparts are mixed black and white; head and neck black; rest of upper parts mixed gray, brown, black, and white.

Identification.—The adult may easily be distinguished from the golden eagle by its white head, neck, and tail. Young birds in their first year can not practicably be identified in the field.

Occurrence.—Doubtless a rare and irregular visitant. J. B. Flett observed an adult male sailing over Wahpenayo Peak (5,500 feet) in the Tatoosh Range during October, 1917, and has on rare occasions noted others of the species, but the bird is evidently not common.

Habits.—Ordinarily one associates the bald eagle with seashore or lake margin; its diet is mainly fish, though it occasionally feeds on squirrels, rabbits, and carrion. The lack of suitable bodies of water doubtless has much to do with the rarity of the bird in the park.

FIG. 75.—Sparrow hawk, Portland, Oreg. A beneficial species, feeding chiefly on insects (principally grasshoppers) and mice. (Photograph from life by William L. and Irene Finley)

DESERT SPARROW HAWK

(*Cerchneis sparveria sparveria*)

Description.—Size small; male 8¾ to 10½ inches long, wing slightly more than 7 inches; length of female 9½ to 12 inches, wing slightly more than 7½ inches. Its wings are narrow and pointed; the adult male has the top of the head bluish gray or dark slate, the crown with or without a rufous patch; cheeks with two black stripes; back rufous, with or without black bars or spots; the tail chestnut rufous, crossed by a broad black band near end, the wings grayish blue, more or less spotted with black; underparts varying from white to deep rufous, with or without black spots. The adult female is similar to the adult male but has the tail, wings, and back

crossed by numerous narrow bands of dusky. The young are similar to the adults, but the colors are more blended, and the young male has the feathers of the upper parts edged with whitish.

Identification.—The black face marks separate this hawk from the sharp-shinned hawk of similar size, and besides, it is a plumper bird of quite different habits. The wings are long and pointed instead of short. The red tail always distinguishes the male sparrow hawk from the sharp-shinned. The sparrow hawk spends more time in the upper air, and is seldom found skulking about in the shelter of low trees and shrubbery, as is the sharp-shin's habit.

Occurrence.—From the park boundaries to timber line. Breeding from the Transition Zone on Stevens Creek (3,000 feet) to the Hudsonian Zone at Owyhigh Lakes (5,100 feet). Occasionally seen above timber line.

Habits.—The sparrow hawk is the most abundant and conspicuous rapacious bird in the park. It is a characteristic member of the "ghost tree" fauna. The standing dead stubs furnish nest sites; and insect food is doubtless more abundant in the open burns where stubs are found than in the deep forest near by. The bird is common on the arid highlands of Yakima Park (6,000 feet) and Burroughs Mountain (7,100 feet). In the former locality more birds were observed than anywhere else in the park. A generous supply of insects was doubtless the reason for the bird's abundance.

This hawk has an attractive habit of poising in air on rapidly vibrating wings, often appearing to maintain itself in the same place for some moments. Upon sighting an insect, mouse, or other object of pursuit the bird will drop rapidly to earth and strike its prey, sometimes eating it on the spot but frequently bearing it away in triumph to a convenient stub.

Sparrow hawks were doubtless breeding throughout the park area. The nest is often placed in an old woodpecker hole or the crevice of a dead tree top. Parents with young were observed at the snout of Nisqually Glacier (3,900 feet) and at Louise Lake (4,500 feet) August 2; White River, between Glacier Basin and Granite Slide (5,500 feet), August 8; and Owyhigh Lakes (5,700 feet), August 9–12. The young were in all cases nearly full grown and were sure to attract attention, as they flew restlessly about from stub to stub uttering their shrill *killy killy killy* calls.

The forage range of the birds is not great. A company of four under observation for several days at Owyhigh Lakes could always be found within a half mile of a certain tract of "ghost trees" on the east slope of Tamanos Mountain, and each of the two or three times we passed the glacier checking station en route from Longmire to Paradise Park a family of sparrow hawks was observed in a near-by forest of stubs.

On July 30 one bird was seen in the vicinity of Ricksecker Point flying about in a thick fog.

Sparrow hawk is, of course, an unfortunate misnomer, for there is ample evidence that insects form the leading article of the bird's diet. Of 320 stomachs of sparrow hawks examined by the Biological Survey, 215 contained insects; 101, mammals; and 54, birds.

The stomachs of several sparrow hawks from Mount Rainier National Park were full of large grasshoppers.

SPOTTED OWL

(*Strix occidentalis occidentalis*)

Description.—Length, 19 inches; wing, 12 to 13½ inches; upper parts brown, head and neck spotted with round white spots; wing quills spotted with brown and whitish, and narrowly tipped with whitish; tail banded; underparts whitish, barred and spotted with brown.

Identification.—The comparatively large size, the absence of ear tufts, general dark brownish and buffy whitish coloration, and transverse barring beneath suffice to identify this owl.

Occurrence.—Doubtless a rare breeder at lower levels.

Habits.—C. A. Stoner, of Ashford, Wash., discovered a pair of adults and two young in the alders and vine maples of the Ohanapecosh River bottom near Ohanapecosh Hot Springs (2,000 feet), in the extreme southeastern corner of the park, on July 28. The young, but recently out of the nest, were being fed by the parents, and had evidently been hatched in the vicinity. The stomach of the old bird contained the remains of a flying squirrel.

SAW-WHET OWL

(*Cryptoglaux acadica acadica*)

Description.—Length, 7¼ to 8½ inches; wing, 5¼ to 6 inches. Adults have eye ring whitish, face streaked with dark brown; under parts white, vertically streaked with reddish brown, most thickly on breast; upper parts olive brown, marked with white, finely streaked on head, and coarsely streaked or spotted on back, wings, and tail; feet plain white or buffy. The young have the face blackish, in sharp contrast to white eyebrows and white malar streak; upper parts and breast plain dark seal brown; wings and tail as in adult; belly yellowish brown.

Identification.—Smallest owl in the park except the pigmy; no ear tufts; wing less than 6 inches long; a conspicuous white mark on forehead.

Occurrence.—Principally in the Hudsonian Zone, between 5,000 and 6,000 feet altitude. There is one record for Bear Prairie in the Canadian Zone, 3½ miles south of Longmire.

Habits.—This, perhaps the most interesting owl in the park, is one with which the camper is most likely to become acquainted, for the saw-whet seems to be a victim of uncontrollable curiosity. One evening, just at dusk, as several members of the party were seated about the camp fire at Owyhigh Lakes, one of these little owls flew into camp and perched, quite unconcerned, on a tree near the fire, as if wishing to join the circle.

Another owl did the same thing at Sunset Park; and at St. Andrews the evening twilight was made particularly interesting by the movements and curious call notes of saw-whet owls. Their interest in our camp was very obvious; five were caught in traps set on the tops of low posts, two being taken in one night on our camp-kettle supports, and others in traps on posts in clearings in the nearby woods.

The traps were sometimes, but not always, baited with mice. Warburton attracted several by squeaking with the lips, one approaching to within 6 feet. On more than one occasion their curiosity, or stupidity, maybe, drove them into our tent. A peculiar sensation it was, to waken suddenly and hear the call of an owl sounding within 6 feet of one's ear, followed soon by the soft flutter of wings as the bird left the tent.

They appeared to be most active at dusk and again an hour or so before daybreak.

Few natural sounds possess greater intrinsic interest than the call notes of owls. Heard near at hand in the dusk of the evening, they signify the presence of a soft-plumaged hunter, his bright eyes doubtless fixed upon you in wondering curiosity. Ordinarily the owl himself does not venture into view, but remains invisible in the all-concealing shadow of night or the friendly shelter of the foliage of some near-by conifer.

Unfortunately, the owl language, while interesting and pleasant to hear, is usually very hard to understand; and it is even more difficult to convey any adequate impression of the ejaculations, imprecations, or plain conversations of the birds when in talkative mood.

> Twice we observed them in the tops of tall evergreens in the morning sun light, uttering their characteristic call notes. The call is best described as a hollow, low-pitched whistle with a decided bell-like quality. The call is given at irregular intervals, and is subject to much variation. At times it can hardly be distinguished from the call notes of the Townsend chipmunk. The short syllables are often combined into a series of low *hoots*, in effect not unlike the whistling sound made by the wings of the goldeneye duck as it leaves the water, although the whistle of the duck's wings is of course much louder. (Cantwell MS.)

Cantwell describes their flight as quite unlike that of other owls, partaking more of the nature of the labored undulating flight of the small woodpeckers. Shaw says their flight is rapid for an owl, giving the bird a sprightly appearance not observed in others. This peculiar flight helps identify individuals encountered in the daytime.

Although mice and other small mammals ordinarily constitute the principal food of the saw-whet owl, we found the bird feeding largely on grasshoppers. A pellet found at St. Andrews Park contained bones and hair of a red-backed mouse (*Evotomys gapperi saturatus*). The stomach of one examined contained a grasshopper and a red-backed mouse.

The saw-whet is one of the most conspicuous breeding owls in the park. Our bird visitor at Owyhigh Lakes August 11 was an immature; and another young bird was taken at St. Andrews Park September 9.

Shaw finds the saw-whet owl to be of a sociable disposition, and states that it responds readily to kind treatment in captivity. It even possesses some vocal ability, and frequently, if stroked gently, will enter upon a song, which, while subdued and low like the songs of some mice, is nevertheless pleasing and harmonious. This habit was noticed in a captive specimen in the possession of Mrs. M. McLaughlin, of Pullman, Wash.

FIG. 76.—Young screech owl, Portland, Oreg. (Photograph from life by William L. Finley and H. T. Bohlman)

KENNICOTT SCREECH OWL[3]

(*Otus asio kennicottii*)[4]

Description.—Moderate in size; length about 11 inches, wing about 7 inches; in "red" phase upper parts dark sooty brown, mottled and streaked with black; scapular streaks and spots on edge of wings rich buff; lower parts heavily mottled, lined, and crosslined with black; legs and feet rich buff brown, finely mottled with buffy. The "gray" phase is rare; general color of upper parts approaching fuscous or blackish; lighter markings light brownish instead of white, and underparts much more heavily penciled and spotted.

Identification.—The conspicuous ear tufts in connection with small size separate the screech owl from any other. Ordinarily the "mournful rolling call" is the only sign of its presence, for it is wholly nocturnal.

Occurrence.—Likely to be encountered almost anywhere in the timbered areas of the park. Apparently rare.

Habits.—There are few localities in the United States and southern Canada which are not inhabited by some kind of screech owl, and consequently the bird is well known to many. The nest is situated in a hollow tree, four or five white eggs making the set. Economically considered, it is one of the most beneficial of birds, mice constituting the chief part of its food.

The call of a screech owl was heard close to our camp fire at Spray Park, 5,500 feet, August 29, about 9 p. m. This is our only record.

GREAT HORNED OWL

(*Bubo virginianus lagophonus*)[5]

Description.—Size large; male about 18 to 23 inches long, wing about 14½ to 15½ inches; female 22 to 25 inches long, wing about 16 inches. Adults have ear tufts blackish; iris bright yellow; face generally sooty mixed with grayish white; throat white; rest of underparts white or buffy, mottled and barred with brownish; flanks buffy; upper parts mottled dark brown, grayish, and buffy, darker colors prevailing; wing quills and tail banded with dull brown; whole plumage irregularly varied with buffy, tawny, whitish, and dusky. The young have the wing quills and tail feathers as in the adult, rest of plumage dull buffy or ochraceous, everywhere barred with dusky.

Identification.—The large size and conspicuous ear tufts are sufficient to identify these birds wherever seen. Ordinarily the deep booming "*whoo, whoo, hoo-hoo, who*," issuing in the darkness of night from the impenetrable gloom, is the only indication of their presence.

Occurrence.—Likely to be encountered at any altitude in the park; heard by our party in the Hudsonian Zone only, between 4,900 and 5,700 feet.

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[3] Named in honor of Robert Kennicott, naturalist, and leader of the Russian-American Telegraph Expedition; was born in New Orleans, La., Nov. 13, 1835, and died near Nulato, Alaska, on May 13, 1866.

[4] Subspecies in doubt. The bird may be referable to the form of the interior, *O. a. macfarlanei*.

[5] Subspecies in doubt.

Habits.—The booming hoot of the horned owl is a part of the camp life of America. Heard usually during the afterglow of the evening and again in the hours just before daylight, the owl call speaks of forest depths. Heard close at hand the notes are loud and vigorous, dominating all else; if far away, they are much subdued.

The hours of daylight are spent in seclusion, for the birds are strictly nocturnal. Occasionally, in the low country, a sharp-eyed crow discovers the unlucky owl's roosting place. Presently the air seems full of scolding black figures, cawing imprecations. At such a time the owl may be heard hooting his defiance; but often he is compelled to take refuge in flight, amid the uproarious cries of his dusky pursuers.

FIG. 77.—Great horned owl, Jennings Lodge, Oreg. (Photograph from life by William L. and Irene Finley)

The nest of the horned owl is often placed in the cavity of a dead tree top or may be a reconstruction of an abandoned hawk nest. The birds nest early and are sometimes found incubating during late snowstorms.

CALIFORNIA PIGMY OWL

(*Glaucidium gnoma californicum*)

Description.—The smallest owl in the park; length 6½ to 7½ inches, wing about 3½ to 4 inches. The adults have under parts white, chest heavily washed with reddish brown, thickly streaked with dark brown; sides brownish, indistinctly spotted with lighter; upper parts dark slaty gray, olive brown, or dark rusty brown; head specked with white. Tail blackish or brownish, barred with white. The young are like the adult but the top of the head is plain.

Identification. The combination of extremely small size and absence of ear tufts, rounded outline of head, and owl-like bodily physiognomy permit ready identification of this bird. There is a possibility of confusion with the saw-whet, perhaps; but the saw-whet is more nocturnal than the pigmy.

Occurrence. Likely to be encountered anywhere in the park. Our records are for Sunset Park (8,000 feet) and Longmire (2,700 feet).

Habits. When the sun appeared at Sunset Park on September 9 after the almost continuous rains of several days a thrill of delight seemed to permeate all nature. With unbounded enthusiasm and high spirits the woods people came out for a sunning. Among the birds was a pigmy owl which was sighted 20 or 30 feet above the ground on the branch of a "ghost" tree. Fluffing its feathers until it looked like a little round ball, it basked for some moments in the grateful sunshine.

J. B. Flett writes of a tragedy that occurred at Longmire during November, when a pigmy owl alighted in a fir tree near his cottage. "I heard a battle raging outside and went out to find one owl dead and a flock of 8 or 10 camp robbers (*Perisoreus obscurus griseus*), led by a Steller jay (*Cyanocitta stelleri stelleri*), chasing another one into the woods."

This tiny owl is a lover of daylight, or perhaps more accurately of twilight; so that it may be seen somewhat more frequently than others.

WESTERN BELTED KINGFISHER

(*Streptoceryle alcyon caurina*)

Description. Length 11 to 14½ inches, wing 6 to 6½ inches; adult male with underparts white, blue-gray belt across breast; crest and upper parts bluish gray; a white collar around back of neck; wing quills black, marked with white; tail with middle feathers bluish gray, the rest black, spotted with white. The adult female is similar, but the belly is partly banded and the sides heavily washed with rufous. The young are like the adults, but male with breast band and sides tinged with rust color.

Identification. The heavy head and stout spear-shaped bill, with the prominent occipital crest, short tail, bluish gray upper parts, white underparts, and blue-gray belt across breast, distinguish this bird from all others.

Occurrence. Park boundaries to timber line. Likely to be encountered in any suitable situation.

Habits. The belted kingfisher appears to live unto himself alone. He is a patroller of streams, a fisherman of staid and sedate habits. On his beat are certain dead snags projecting from the water to a height of 10 or 20 feet, sufficient to enable him to view the surface of the stream or lake below. Here he patiently sits, uttering now and then a low rattling note. Failing, perhaps, to locate any little frogs or fishes, he swoops down near the surface of the water and skims up or down stream to his next post of observation uttering a vigorous rattle call on the way. If a fish ventures near the surface the kingfisher immediately drops from his vantage point and strikes

the water with a splash, usually returning in a moment with his wriggling quarry. In open situations where no trees are convenient he often flies to the desired height above the water and poises in mid-air to make his observations.

A burrow excavated in an earth bank serves the kingfisher for a nest site. The eggs are laid at the end of the burrow often 4 to 15 feet from the entrance.

Over much of the park area the lakes and streams contain no fish; but usually, in such cases, there is a liberal supply of frogs. One might imagine that little lakes hidden in the thick woods, as Lake James, for example, would not be readily located by such birds as the kingfisher. The ability of these birds to pick a course, apparently direct, toward their objective, often in spite of rain, fog, forest, and

FIG. 78.—Eyes left! Young kingfishers much resemble the adults in markings. (Photograph from life at Portland, Oreg., by William L. Finley and H. T. Bohlman)

darkness, inevitably reminds us of the extent of our ignorance concerning birds and their movements; and we can scarcely avoid wondering whether they do not, after all, possess some sixth sense.

HARRIS WOODPECKER[5]

(*Dryobates villosus harrisi*)

Description.—Somewhat smaller than a western robin; length 9 to 10 inches; tail about 4¾ to 5¼ inches; adult male with upper parts black, nape scarlet, white stripe down back, wing coverts and innermost flight feathers plain black or lightly spotted with white; outer flight feathers with white spots; outer tail feather plain white; underparts smoky gray or light smoky brown. The adult female is similar, but lacks the scarlet nape. The young are similar also, but

[5] Named in honor of Edward Harris, an intimate friend of Audubon, who was born at Moorestown, N. J., Sept. 7, 1799, and died in Moorestown in June, 1863.

have the forehead spotted with white and the scarlet of nape extending partly or wholly over the crown.

Identification.—The prominent white stripe down the black back distinguishes the Harris and Sierra woodpeckers from all others in the park except the downy, which is much smaller (length 6¼ to 7 inches, as compared with 9 to 10 inches in the Harris woodpecker), and the Alaskan three-toed, the male of which has a yellow crown patch. The smoky underparts separate it from Sierra woodpecker, but ordinarily these closely related forms can not be certainly dis-

FIG. 79.—Harris woodpecker, Dayton, Oreg. (Photograph from life by William L. Finley and H. T. Bohlman)

tinguished in the field. It is ordinarily difficult, on color alone, to distinguish the Harris woodpecker from the Alaskan three-toed, though their habits and call notes are different. The Harris woodpecker, however, has some red on head in every stage of plumage beyond the natal, while the Alaskan three-toed has none.

Occurrence.—Principally, perhaps, in the Canadian Zone, from the boundaries of the park to 4,500 feet. Our specimen records are for the west and south sides.

Habits.—When seen for the first time one is apt to think that the Harris woodpecker has become discolored by coming in contact with charred stumps, but the "smoky" breast is fast color. The

bird is active and energetic in his movements and relentless in his pursuit of the larvæ of wood-boring beetles. His presence can frequently be detected by intermittent rapid tapping in the woods. He may be found at any point on a tree trunk from the stump to the highest dead branch. Using his chisel-like beak, he flakes off the scaly bark or cuts directly into the more solid wood. Sometimes he drills large round holes in the bark. When he has finished with one tree he launches into the air and with noisy wing beats seeks a new locality.

A remarkable adaptation for securing insects is his long extensible tongue, which can be inserted far down into the burrow of the wood borer.

This woodpecker was seen on western hemlock, Douglas fir, lovely fir, alpine fir, and alders, and even occasionally on large logs.

As is well known, western Washington is a region of copious rainfall. During the frequent downpours one can not help speculating on the manner in which the different birds and mammals avoid injury from the damp and chill of the storm. The thick foliage of firs and hemlocks is well suited, in many instances, to serve as a thatched roof; and in the deep woods there are many big branches and large logs under which birds—and mammals, too—find dry retreats. During the heaviest rain of the summer a Harris woodpecker was frightened from its shelter beneath a huge log in the heavy forest of Tahoma Creek Canyon. Here the bird was keeping perfectly dry. One can imagine its displeasure at being driven out from its comfortable refuge into the drenching rain.

SIERRA WOODPECKER

(*Dryobates villosus orius*)

Description.—Essentially like the Harris woodpecker, except that its underparts are white below.

Identification.—Distinguishable from other woodpeckers by the same characters cited for the Harris woodpecker. From the latter bird the Sierra woodpecker can not ordinarily be separated at long range in the field, but close at hand its white underparts separate it from the smoky-breasted Harris woodpecker.

Occurrence.—Our only definite record is for Reflection Lakes (4,900 feet), where a specimen was obtained by Stanley G. Jewett.

Habits.—So far as known, not essentially different from those of the Harris woodpecker.

GAIRDNER WOODPECKER[6]; DOWNY WOODPECKER

(*Dryobates pubescens gairdneri*)

Description.—Smallest woodpecker in the park area—about half the size of the Harris woodpecker, somewhat larger than an English sparrow; length 6¼ to 7 inches, wing about 3½ to 4¼ inches. Similar in general appearance to the Harris woodpecker. Adult male with upper parts black, with dingy whitish forehead, scarlet nape, and white stripe down back; middle and greater wing coverts plain

[6] Named in honor of Dr. Meredith Gairdner, a surgeon at Fort Vancouver, Wash., who collected in that vicinity in the thirties and died previous to 1840.

black, or only lightly spotted with white; outer tail feathers white, barred with black; underparts smoky gray or light smoke brown. Adult female similar but without scarlet on nape. Young similar also, but with red of nape extending partly or wholly over crown.

Identification.—The smaller size of the downy woodpecker and the black barring on the white outer tail feathers separate it from the Harris and the Sierra woodpeckers, each of which has a broad white stripe on a black back. From the Alaska three-toed woodpecker it is distinguished by smaller size and by the absence of yellow patch on the crown in males, as well as by the presence of some red on the head in all stages of plumage.

FIG. 80. Alaska three-toed woodpecker, James Lake. Note the three toes only on the foot. From specimen posed in natural habitat. (Photograph by William T. Shaw, State College of Washington)

Occurrence.— Doubtless principally at lower levels in the park. Definite records were secured for three localities only—Reflection Lakes (4,900 feet), July 20; White River entrance (3,200 feet), August 15; Longmire (2,700 feet), October 1.

Habits.—The downy woodpecker prefers deciduous trees such as alders, cottonwoods, and willows along creek banks rather than the dense coniferous timber. In farming districts or settled localities it is usually well known, for it is a sociable little body, appearing characteristically in orchards, and in winter often approaching houses to be fed. Its nest is a neatly excavated cavity usually placed in a soft-wooded dead stub.

ALASKA THREE-TOED WOODPECKER

(*Picoides americanus fasciatus*)

Description.—Size of hairy woodpecker; length 9¼ inches, wing 4½ to 4¾ inches. Adult male with upper parts black, with white nuchal band and back usually distinctly barred with white, rarely continuously white along middle line, secondary wing feathers distinctly spotted with white, sometimes wing coverts also spotted more or less with white; wing quills barred with white, outer tail feathers

mainly plain white; crown with yellow patch, back of head glossed with blue; underparts white, sides and flanks barred with black. The adult female is similar, but has no yellow on the crown; occasionally with white prevailing on top of head.

Identification.—With the bird in hand there is, of course, no difficulty in separating it from any other in the park, for it is the sole species with only three toes.[8] One can easily tell by its habits that it is a member of the woodpecker family. This done, there are three other woodpeckers with which it might be confused, namely, the Harris, Sierra, and downy woodpeckers, from all of which it is separated by the yellow crown patch in the adult male and the absence of red in female and young. From the downy woodpecker it is further distinguished by its considerably larger size. The color characters indicated are not ordinarily observable except at short range.

Occurrence.—Rare and local in the Canadian and the Hudsonian Zones.

Habits.—The James Lake region had evidently been swept by fire some two years before. The work of forest destruction begun by fire had been taken up and was being carried on by wood-boring insects. The work of the insects, however, was not without opposition. There, too, were the woodpeckers, enemies of the wood borers, virtual tree-trunk police, among them the red-shafted flicker, the Harris woodpecker, and the Alaska three-toed woodpecker.

The three-toed woodpecker is apparently never common, but where found is always of interest. One of the more obvious of its characteristics is its habit of *tap tap tapping* on the dead trees, which often reveals it when otherwise it would be passed by undetected. In the James Lake burn the bird was noted on August 22 working both high and low in the trees. Occasionally it uttered a call note somewhat like *perk perk*, and sometimes a rapid run of syllables resembling *tisa tisa.* (Shaw MS.)

The birds were seen nowhere else in the park, and whether the species breeds within its boundaries or migrates in from farther north after breeding is unknown.

NORTHERN RED-BREASTED SAPSUCKER

(*Sphyrapicus ruber notkensis*)

Description.—Smaller than the Harris woodpecker; length 8½ to 9¼ inches, wing about 5 inches. Adults have whole head, neck, and chest plain red, sometimes with suggestions of black between red areas on crown or nuchal patch or between red throat and light-colored belly; back, wings, and tail black, heavily marked with white; belly olive yellow. The young are duller, with color pattern less distinct, the red replaced by claret brown.

Identification.—A typical woodpecker in habit; separable from any other woodpecker in the park by its red head, neck, and chest.

Occurrence.—In the Canadian Zone, all around the mountain, for the most part below 4,500 feet.

[8] The Arctic three-toed woodpecker (*Picoides arcticus*), distinguished from the present species by its black back, though recorded from several points in the Cascades, apparently has not yet been detected on Mount Rainier.

Habits.—The sharp eye of the good observer frequently notes a series of horizontal rows of small round holes on the bark of cedar or hemlock, appearing as if drilled and often extending for a considerable distance up and down the tree. These holes are the work of the sapsucker, one of the handsomest of park birds. The drillings may be fresh and exuding sap or they may be old scars from former years. To the sapsucker the sap is an appetizing article of food; and probably the bird feeds also on insects attracted by the oozing liquid. If the drillings are fresh, one can occasionally surprise the bird at its feast. The sapsucker is likely to be so engrossed in securing the sap that it pays little attention to the observer, but often it is a bit shy, and discreetly edges around the trunk, the brilliant feathers of its head elevated the while, giving it a trim and alert appearance. If pressed too hard, it leaps into the air with startled cry, making its departure with strong undulating wing beats.

The dietary of the sapsucker is varied. In addition to sap, the inner bark of trees, and various wild berries the bird feeds on a variety of insects and related forms, including beetles, spiders, ants, grasshoppers, centipedes, and various larvae.

The nest is located in a tree trunk 15 to 25 feet above the ground, the eggs being five or six in number and white in color. The young are much less conspicuous than their parents.

Though probably more fond of deciduous trees than of others, the sapsucker on Mount Rainier affects the conifers, its work being observed on the cedar (*Thuja plicata*), Douglas fir (*Pseudotsuga mucronata*), and western hemlock (*Tsuga heterophylla*). In a number of instances trees have been girdled and killed by the excessive drilling, cedars appearing to have suffered most in this respect.

The abundant evidences of the sapsucker's presence stimulated us to search carefully for it; but not a single individual was seen until September 17 at Bear Prairie, 3 miles south of Longmire. The first sapsucker within the park boundaries was noted near Longmire one week later; and subsequently it was observed at Mesler's ranch, 1 mile west of the Nisqually Park entrance. Apparently the sapsucker entered the park only after the completion of nesting in the lower country.

WESTERN PILEATED WOODPECKER; LOGCOCK

(*Phloeotomus pileatus picinus*)

Description.—Largest woodpecker in the park; about the size of a domestic pigeon; length 15 to 19 inches, wing about 9 inches. Adult male brownish or grayish black; entire top of head, including crest, bright red; chin stripe red; chin and wide stripe on side of head white or sulphur yellow; patches on wings and under wing coverts white, feathers of belly tipped with whitish. The adult female is similar, but the fore part of head and the chin stripe are brown instead of red. The young are like the female, but the crest is a duller red.

Identification.—The large size, slow flight, and ungainly appearance help distinguish this woodpecker. When in flight large white

areas are conspicuous on the wings and the long sharp bill is tipped up forward. The clear ringing flickerlike *yip yip yip yip* call is characteristic also.

Occurrence.—In the Canadian Zone all around the park; seldom occurring above 4,500 feet, though observed once at Owyhigh Lakes, 5,500 feet.

Habits.—The pileated woodpecker, denizen of forest depths, is the largest and probably the shyest of the woodpeckers of the park. With its black and white plumage and scarlet crest one might imagine it a gay courtier among birds, were it not for its awkward movements and retiring habits.

The tattoo of the pileated woodpecker is a vigorous performance, as if some one were pounding with a hammer on a dead tree trunk. When prospecting for food the bird seldom utters any call or cry. A cautious approach sometimes permits a close view of the bird. If, however, the woodpecker sees the observer first it ceases its exploration, and, edging about the tree trunk, eyes him with suspicion. It then hitches awkwardly up the gnarled stub, finally launching forth into midair and hurrying away to remoter parts of the woods. The shrill call note, *yip yip yip yip*, echoes from a considerable distance down the aisles of the forest, and when once alarmed it is next to impossible to relocate the bird.

The pileated woodpecker's habit of tearing large slabs of bark from standing stubs and making irregular excavations in the soft wood of dead trees in search of wood borers and ants widely advertises its presence. The bird was actually heard only a few times in the park; but its work showed its broad distribution. Excavations were observed in dead fir and cedar stubs as well as in live trees of the latter.

LEWIS WOODPECKER[9]

(*Asyndesmus lewisi*)

Description.—Size about that of a western robin, but looks larger; length, 10½ to 11 inches; wing, 6½ to 7 inches. Adults have upper parts iridescent greenish black except for gray collar; face, dull crimson; throat and chest, gray, changing to soft rose on belly; plumage of lower parts, harsh and hairlike. Young have head without red, neck without collar, and under parts with less red.

Identification.—Dark and crowlike in appearance—broad-winged and short-tailed. The black upper parts with gray collar assist in identification. Its habits and manner of flight are unusual in the family.

Occurrence.—Breeding in the limited Transition area within the park. Observed at Longmire (2,700 feet), July 15, and between the Muddy Fork of the Cowlitz River and Nickel Creek (3,300 feet), August 2. In migration likely to be met in semiopen country almost anywhere on the mountain.

Habits.—The phlegmatic disposition and anomalous habits of the Lewis woodpecker make it of special interest to the bird student. In its dark color and measured flight it resembles a small crow.

[9] Named in honor of Capt. Meriwether Lewis (1774–1809), the famous American explorer who, with Capt. William Clark, crossed the continent from St. Louis to the mouth of the Columbia River in 1804. From 1807 to the time of his death he was governor of Louisiana Territory.

FIG. 81.—Young Lewis woodpecker. Portland, Oreg. (Photograph from life by William L. Finley and H. T. Bohlman)

Occasionally as it flies it falls vertically like a tumbler pigeon but more slowly. Sometimes it perches on the tip of a living tree and may be confused with the robin, owing to the somewhat similar color of its breast. It is frequently found in old burns where a few large dead trees are still standing. Several families were observed among the tall snags between the Muddy Fork of the Cowlitz River and Nickel Creek.

Migrating birds were seen as follows: On August 14 an individual appeared at Glacier Basin (5,900 feet). On August 29, about noon, a half dozen birds were seen circling over Mount Pleasant Ridge, Spray Park (6,200 feet); after circling several times they flew west. Three were observed at Sunset Park (5,000 feet) early September 8, and later a flock of some 50 individuals passed over, flying south. Birds were observed at intervals until September 13.

The Lewis woodpecker is deserving of more than passing notice because of its historic interest. It is one of the few birds collected by the famous Lewis and Clark expedition, and was named by Alexander Wilson in honor of Captain Lewis.

NORTHWESTERN FLICKER

(*Colaptes cafer saturatior*)

Description.—Somewhat larger than a western robin; length 12¾ to 14 inches, wing about 6½ to 7¼ inches. Adult male with ground color of head and body brownish, back barred and underparts spotted with black; rump white and tail black; no nuchal band; mustache red; chest marked with black crescent; under side of wings and tail red. The adult female is similar but with a buffy or brown mustache. The young are similar but lack the mustache.

Identification.—The black crescent across the spotted breast and the prominent white rump patch distinguish the flicker.

Occurrence.—From park boundaries to timber line.

Habits.—As the noisiest and most conspicuous, adaptable, and broadly distributed woodpecker in the park, the flicker is bound to achieve some notoriety. It avoids the dark woods, and undoubtedly prefers the tracts of dead stubs which are encountered at fairly frequent intervals around the mountain; for here both nesting sites and food are present in greatest abundance.

As is well known, the flicker nests in a variety of situations. It sometimes lays its eggs and rears its young in holes in stream banks. One bird, observed in Pullman, Wash., nested in the side of a barn between the boards and the tightly packed hay. It has a well-known predilection for drilling holes in the gables, under the eaves, or on the sides of frame buildings.

To a considerable extent the flicker is a ground-inhabiting bird, due to the fact that it feeds largely on ants and other terrestrial insects. In regions where ants are common the bird is known to have passed the winter by digging into the ant hills for food, making excavations several inches deep.

Adult flickers with their young were noted July 23 in a burn between Canyon Bridge and Nickel Creek (3,300 feet).

FIG. 82.—Red-shafted flicker, Portland, Oreg. (Photograph from life by William L. Finley and H. T. Bohlman)

PACIFIC NIGHTHAWK

(*Chordeiles minor hesperis*)[10]

Description.—Nine to ten inches long, wing about 4½ inches. Adult male with white throat patch bordered below by blackish chest patch; belly barred with blackish and white; upper parts mottled grayish; a white band on the wing; tail except middle feathers crossed with broad white band near tip. The adult female has the white of tail restricted or wanting. The young are more finely and profusely mottled than adults.

Identification.—The long swallow-like wings with prominent white patch, the long forked tail, and the white throat patch bordered below by black distinguish this bird.

Occurrence.—Found at lower levels only; occurring in the Transition Zone below 3,000 feet.

FIG. 83.—Nighthawk, Portland, Oreg. Note the short bill, large eye, and long wing. (Photograph from life by William L. Finley and H. T. Bohlman)

Habits.—This soft-plumaged insect catcher, whose characteristic "*peearp*" is so conspicuous a sound during the evening twilight in many localities, was seen by us only once. About 1.15 p. m. on August 2, as we were traversing an extensive burn at the junction of Maple and Stevens Creeks, a single individual was observed circling about over the brake-covered flats. The day was cloudy and very dull; the locality of the open burn type. On August 9, 1897, Dr. C. Hart Merriam saw a nighthawk at Longmire.

VAUX SWIFT

(*Chaetura vauxi*)

Description.—Size of a swallow; length about 4 to 4½ inches, wing about 4½ inches. Upper parts sooty brown, lighter on rump and tail; tail tipped with spines; underparts gray, lighter on throat.

[10] Subspecies in doubt.

Identification.—Swallow-like, but can be distinguished from swallows by its long and narrow wings, which in flight beat with great rapidity. The Vaux swift closely resembles the chimney swift of the Eastern States, but has not as yet taken to nesting in chimneys to any extent. It is not closely related to the swallows, but is allied to the hummingbirds and nighthawks.

Occurrence.—Observed from Longmire (2,700 feet) to Tokaloo Rock Ridge (7,000 feet).

Habits.—For sheer mastery of the air the swifts have few equals. The Vaux swift, though it is less conspicuous than the black swift and more modest in its choice of a nest site than the white-throated, is nevertheless an interesting personage. Circling, sailing, twittering, the swift was seen on all sides of the mountain. Groups of two to six birds were the rule.

On dull days the swifts circled low, descending to within 15 to 30 feet of the ground, presumably because their insect food dropped down also. On sunny days they soared 200 or 300 feet up, and at times probably much higher.

The standing dead stubs and hollow trees furnish abundant sites for the nest, which is unique in being made of small dead twigs cemented together with the bird's saliva. The same mucilaginous material is used to fasten the nest to the inside of the hollow. By using the tail as a prop the bird is easily able to cling to vertical surfaces. In this procedure the sharp spines with which the major tail feathers are provided are doubtless of considerable assistance.

After the middle of August groups of migrating swifts were noted at fairly frequent intervals; 12 or more were observed flying south over Tokaloo Rock Ridge on September 16.

RUFOUS HUMMINGBIRD

(*Selasphorus rufus*)

Description.—Length of male about 3¼ to 3¾ inches, wing about 1½ inches; length of female about 3½ to 4 inches, wing about 1¾ inches; reminding one of a large buzzing insect. Adult males have the feathers on the throat (called the gorget) fire red, orange, and brassy green; general body color bright reddish brown, glossed with bronzy green on crown and sometimes back, and fading to white next to gorget and on belly; tail feathers rufous with dark middle streaks; middle tail feather broad, pointed at the tip, second from middle deeply notched on inner web, sinuated on outer web. The adult female has upper parts bronzy and rufous, rufous on rump and tail coverts; underparts whitish, throat sometimes with a few central brilliant feathers; sides shaded with rufous, tail feathers rufous at base, the middle ones green nearly to base; outer ones with broad blackish subterminal band and white tips; outer tail feather more than one-tenth inch wide. Young males are similar to the adult female, but feathers of upper parts edged with rusty; rump rufous, and throat showing specks of metallic red; young females are similar to young males, but have the rump green and throat specked with green only.

Identification.—The reddish color alone distinguishes this bird from the Calliope humming bird, which is the only other species of the family found in the park.

Occurrence.—From park boundaries to timber line.

Habits.—The hummer is very partial to flowers of brilliant colors, though he has been seen gleaning a breakfast from the foliage of a huckleberry bush. He prefers the open meadows between 4,500 and 6,000 feet altitude, but is seen in the brake-covered clearings of the big burn along Stevens Creek, in the thick Douglas fir timber, and even above timber line.

One would scarcely expect this midget to be a fighter; but he exhibits a belligerency and boldness out of all proportion to his bulk. On numerous occasions we saw the hummer attack a young

FIG. 84.—Rufous hummingbird on nest, Portland, Oreg. (Photograph from life by William L. and Irene Finley)

junco, many times his size, and apparently without the slightest provocation. The hummer would harry the bird unmercifully, literally flying circles about it, until the unfortunate junco took refuge in flight.

As we left Summerland August 6 on the way to Camp Curtis, which was to be the overnight camp just previous to the attempt on the summit of Mount Rainier, a rufous humming bird flew overhead. A little later another was seen flying over Emmons Glacier, altitude 6,000 feet. Signs of life, either plant or animal, became fewer as we climbed, but at 8,500 feet a third humming bird was observed. The site of Camp Curtis, 9,000 feet altitude, was soon gained, and immediate preparations made to remain for the night. We were now hung, as it were, between earth and heaven, 2,500 feet above timber line. The water supply froze shortly after 5 o'clock p. m., and the midsummer breeze was cold and cheerless.

What was our surprise to find the hummers still with us. One whizzed past as we were making camp, and two more were observed the following morning before we started on the main climb.

Our party was not the first to note humming birds in this locality. During the summer of 1896 Bailey Willis and four companions made the ascent of Mount Rainier, camping overnight on Camp Curtis Ridge. Prof. Israel Cook Russell writes as follows concerning an incident of their stay:

> Surrounded as we were by the desolation and solitude of barren rocks, on which not even a lichen had taken root, and pure white snow fields, we were much surprised to receive passing visits from several humming birds, which shot past us like winged jewels. They came up the valley occupied by the Emmons Glacier, turned sharply at the Wedge, and went down the way of the Winthrop Glacier. What tempts these children of the sunlight and the flowers into the frozen regions seems a mystery. That the humming birds are bold explorers was not new to me, for the reason that on several occasions in previous years, while on the snow-covered slopes of Mount St. Elias, far above all vestiges of vegetation, my heart had been gladdened by glimpses of their brilliant plumage. (Eighteenth Annual Report, United States Geological Survey, 1898, p. 370).

CALLIOPE HUMMINGBIRD

(*Stellula calliope*)

Description.—Smallest of the hummingbird family found in the United States; length of male 2¾ to 3 inches, wing about 1½ inches; length of female about 3½ inches, wing about 1¾ inches. Adult male with gorget rose purplish, white bases giving effect of streaking; upper parts metallic green; tail feathers dusky, bases edged with rufous, tip wider than base; underparts white; sides tinged with brown and green. The adult female has the upper parts bronzy green; tail rounded and tail feathers greenish gray basally with touch of rufous, black-banded, and tipped with white, except middle pair, which are green, ending in dusky. The young are similar, but have the underparts washed with rufous, the throat specked with dusky.

Identification.—The greenish rather than rufous coloration of the upper parts separates this humming bird from the rufous.

Occurrence.—Doubtless a common species in the Hudsonian Zone, from 4,500 feet to timber line.

Habits.—The nest of the hummingbird is one of the most fascinating of natural objects. The Calliope hummer is said to build its nest of willow down, using bits of bark for a protective covering, and placing the structure on or against a dry cone or the dead limb of a pine.

Hummers of this species were positively identified by Dr. A. K. Fisher July 28 to August 5, 1897, in Paradise Park, where individuals were seen feeding about some dwarf firs, and Stanley G. Jewett, who observed females at Reflection Lakes, July 19, 1919.

OLIVE-SIDED FLYCATCHER

(*Nuttallornis borealis*)

Description.—Size about that of a western bluebird; length between 7 and 8 inches, wing about 4 to 4½ inches. Adults have the

underparts with whitish median tract between dark, somewhat streaked, lateral parts, white sometimes faintly tinged with yellow; upper parts sooty, with a conspicuous tuft of white cottony feathers on flanks (usually, however, concealed by the wings). The young are similar, but the wing coverts are tipped with buffy, or brownish, instead of white.

Identification.—The three-parted whistled call note, *whut whee tew* or *whit whee haw*, once heard, is easily remembered and is one of the best ways to tell the bird. It has a habit of perching in a conspicuous position on the extreme tip of a tall tree. At close range the dark back and sides, with whitish throat and median line of belly, can be observed. More rarely the cottony rump tufts are visible.

Occurrence.—In moderate numbers all around the mountain, principally at the upper border of the Canadian Zone and in the lower portion of the Hudsonian, between altitudes of 4,000 and 5,000 feet. Individuals were seen as low as 3,600 feet and as high as 6,000 feet.

Habits.—One gloomy day in August during a fog and rain on Cowlitz Divide an olive-sided flycatcher was seen moping on the tip of a small fir only 12 feet above the ground. It was under the spell of the weather; at least so its quiet and moody bearing seemed to indicate. Ordinarily one looks for it on the tip of some tall tree, calling its greetings to the entire countryside. Mrs. Bailey records one series of call notes as *pu pip, pu pu pio, pu pip, pu pu pio.* (Handbook of Birds of the Western United States, 1917, p. 257.) A note heard by us at Reflection Lakes was *prrit prrit prrit.* The olive-sided is the largest and most interesting of the flycatchers of the region. Perhaps, excepting the western flycatcher, it is the only one likely to be encountered by the tourist. The birds were doubtless nesting in the park, as individuals and pairs were commonly observed after July 3.

WESTERN FLYCATCHER

(*Empidonax difficilis difficilis*)

Description.—Length 5½ to 6 inches, wing 2¼ to 3 inches. Adults have upper parts olivaceous (brownish in winter), wing bars dull buffy (brighter in winter); underparts dull yellow, shaded with brown across breast, brightening to sulphur yellow on belly and under tail coverts; under wing coverts buffy, deepening to ochraceous on edge of wing; bill broad at nostrils. The young are similar, but browner above, with wing bands yellowish brown or rusty buff, sulphur yellow of belly replaced by dull white.

Identification.—The yellowish underparts ordinarily distinguish the western from any other flycatcher. The whistled call note *whew wheet!* is most useful to identify the bird in the field.

Occurrence.—In the Transition and lower Canadian Zones, between altitudes of 2,500 and 4,500 feet. Noted principally on the south side of the park.

Habits.—The cheerful whistle of the western flycatcher is an attractive note wherever the bird occurs. Individual birds were observed in the forest of western hemlock, white pine, and vine maple along the Rampart Trail near Longmire, and the hemlock-fir woods

at Nickel Creek and on Cowlitz Divide. They were noted also in the willows and alders of Stevens Creek Canyon. The species was more abundant along Skate Creek between Lewis, Wash., and Bear Prairie, immediately south of the park, than anywhere else in the vicinity.

Individuals observed were doubtless nesting. Even where the western flycatcher is abundant it is seldom seen, though frequently heard. Its modest dress and retiring habits and the natural seclusion afforded by its forest or brushland habitat usually serve as an effective concealment.

LITTLE FLYCATCHER

(*Empidonax traillii brewsteri*)

Identification.—Size slightly larger than western flycatcher. The birds of the genus are small olivaceous species with wing usually less than 3¼ inches long; the head lacking a crest, the bill usually broad as compared with its height at base. Both the Hammond flycatcher (*Empidonax hammondii*), and the little flycatcher (*Empidonax traillii brewsteri*), in addition to the western flycatcher, already treated, should perhaps occur in the park.

Occurrence.—Likely to be encountered in appropriate habitats throughout the Transition and Canadian Zones.

Habits.—The call note of an individual observed July 16 in the brush of the big burn on Stevens Creek was put down as *Whikso.* A second individual, solitary and silent, was seen August 1 in the alder brush of a logged-off area near Fairfax, Wash., 4 miles west of the northwest corner of the park.

PALLID HORNED LARK; HORNED LARK

(*Otocoris alpestris arcticola*)

Description.—Size somewhat larger than an English sparrow, length about 7½ to 8 inches, wing about 4½ to 4¾ inches. The adult male in summer has the back and wings dark brown, the feathers edged with paler; the hind part of crown, occiput, nape, bend of wing, and upper tail coverts pinkish vinaceous; middle pair of tail feathers like the back; the rest brownish black, the outer ones margined with whitish; fore part of crown, horns, areas in front of eyes, cheeks, and breast crescent black; forehead, line over eye, throat and remainder of lower parts dull white, the sides streaked with brown. The adult female is similar, but lacks the distinct black area on the head. The nape is brownish gray with but slight tinge of pink; hind head and nape narrowly streaked with brown; tail slightly more brownish than in male.

Identification.—The black breast shield contrasting with the whitish throat and underparts, the contrasted face marks, and the horns distinguish this bird from the pipit, which is perhaps the only species with which it is likely to be confused.

Occurrence.—On meadows and grassy slopes above timber line (6,500 feet) on the east side of the mountain. Zone, Arctic-Alpine.

Habits.—The first horned larks seen in the park were encountered on Panhandle Gap on August 5. Here on a grassy flat at an alti-

tude of 7,300 feet, a small bird,[11] unable as yet to fly, was found and captured. On being handled the young bird disgorged three locust-like insects and a green worm. The mother remained close by while our studies were in progress, uttering a call note *chipew chipew*. Panhandle Gap is an area of considerable extent, covered with grasses and flowers, and on the south sloping gently toward the Ohanapecosh River; to the north it drops abruptly some hundreds of feet to the Sarvent Glaciers. The locality is well above timber line, and a favorite resort of ptarmigan and mountain goat.

On August 17, two groups of horned larks, all badly molting, and apparently migrating or about to do so, were seen on the broad flat ridge known as Burroughs Mountain (7,200 feet). The rocky character of this ridge, which is more than 2 miles long, its sparse vegetation, and its bleak and wind-swept appearance doubtless make it a congenial habitat for the birds. They were stalking about among the dwarfed patches of vegetation, lupine, phlox, lousewort, and *Veronica* in a very stately and dignified manner, taking flight only when closely pressed. While on the ground their call was like *tweetsoo;* on the wing it was nearer *tsinktink.*

The horned lark's habit of singing on the wing is well known. In this he shows his affinities with the skylark; but the song itself is a musical tinkle, which, though attractive, has little in common with the ambitious effort of the skylark.

MAGPIE

(*Pica pica hudsonia*)

Description.—Length 17 to 22 inches, wing 7¼ to 8½ inches; adults black, varied with bronzy iridescence, except for white belly and wing patches; tail long and graduated; bill and naked skin of orbital region black. The heads of young birds lack the bronzy gloss.

Identification.—The large size, unusually long tail, contrasted black and white plumage, and conversational call notes facilitate identification.

Occurrence.—A migrant and winter visitant in the park. First observed in the Hudsonian Zone, above 4,500 feet. Later some descend to lower altitudes. J. B. Flett reports that at least one magpie winters regularly at Longmire, though the birds are more common in Paradise Valley.

Habits.—Although restricted to the eastern part of the State during the nesting season, in the fall the magpie wanders broadly, invading western Washington in certain sections, and occasionally remaining for the winter. This is the case on Mount Rainier. The first birds were seen on August 28, and individuals were noted at intervals thereafter until late in September.

The magpie is a handsome bird, and his sagacity and loquacity are well known. He avoids the deep timber, preferring brushy canyons, where, alone or with his companions, he can travel from tree to tree or rocky ledge and still comprehend in his glance a broad

[11] This record constitutes a considerable extension of the breeding range of the pallid horned lark. It had not previously been definitely known, though suspected, that this form breeds in the high Cascades of Washington. See Taylor, The Auk, vol. 42, pp. 349–353, July, 1925.

expanse of country. When on the wing in the distance he resembles a biplane with long balancing tail. A nearer view reveals a quick wing stroke. In passing from a mountain side to the depths of a canyon he makes a succession of oblique dives. He builds his nest in some convenient hawthorn (*Crataegus*). From the ground the structure looks like a pile of twigs and sticks; it is roofed over, a hole in the side serving for an entrance. The nest derives some protection from the dense and thorny branches of its hawthorn host. The magpie is very fond of meat, even carrion being relished. At Spray Park two of the birds were taken in traps set for predatory animals and baited with mouse bodies.

STELLER JAY

(*Cyanocitta stelleri stelleri*)

Description.—Larger than a western robin; length 12 to 13 inches, wing $5\frac{1}{2}$ to $6\frac{1}{4}$ inches. Adults with fore parts of body dull blackish, changing to pale blue on lower back and belly; wings and tail purplish blue, barred with black. The young are similar but duller, wing bars faint or wanting.

Identification.—A prominent crest, with dark bluish coloration and saucy prying habits, characterize this bird.

Occurrence.—Commonly found from park boundaries to about 3,000 feet altitude. Abundant at Longmire. A vertical migration takes place in late summer, when the birds may be found in the high parks just below timber line.

Habits.—The forest would lose much of its charm were it deprived of the loud, half-scolding, half cheering calls of the jay. He is noteworthy for his fondness for human society, or rather for the good pickings that go with it. As to diet he is more or less omnivorous; and he is alternately bold if all goes well, and shy if something excites his suspicions.

From early Indian days the jay has drawn and held the attention of the people. In the legend of "Hamitchou," perhaps the most famous Indian tale associated with Mount Rainier, the "blue jay" is mentioned no less than three times. When Tamanous, Indian deity, vouchsafed the great secret of the treasure on the summit of the mountain to his protege, the Indian miser, there came a silence more terrible even than the voice of Tamanous. In the words of Theodore Winthrop, "All life and motion seemed paralyzed. At last Skai-ki, the blue jay, the wise bird, foe to magic, sang cheerily overhead. Her song seemed to refresh again the honest laws of nature. The buzz of life stirred everywhere again, and the inspired miser rose and hastened home to prepare for his work." (Quoted in Meany, Mount Rainier, 1916, p. 45.)

After the miser's tempestuous experience on the summit of the mountain in pursuit of the coveted treasure he fell into a sleep of enchantment lasting many years. "It seemed a long slumber to him, but at last he awoke. The jagged moon was just paling overhead, and he heard Skai-ki, the blue jay, foe to magic, singing welcome to sunrise. It was the very spot whence he started at morning."

He built a fire, plucked some kamas, and set it on to roast. "After he had made a hearty breakfast of the chestnut-like kamas bulbs,

and, smoking the thoughtful pipe, was reflecting on the events of yesterday, he became aware of an odd change in his condition. He was not bruised and wounded from head to foot, as he expected, but very stiff only, and as he stirred his joints creaked like the creak of a lazy paddle upon the rim of a canoe. Skai-ki, the blue jay, was singularly familiar with him, hopping from her perch in the arbutus, and alighting on his head. As he put his hand to dislodge her he touched his scratching stick of bone and attempted to pass it, as usual, through his hair. The hair was matted and interlaced into a network reaching fully two ells down his back. 'Tamanous,' thought the old man." (p. 54.)

Unfortunately Skai-ki has another side to her character. While comporting herself with much dignity and the appearance of respectability, we know that she and her husband, too, are crafty villians, for it is well known that they are not averse to robbing other birds' nests and eating their eggs.

If the jay were human we might conclude him subject to moods; sometimes he will be quiet, but more often his cries ring loudly through wood or over clearing. If an unfortunate owl is discovered by the jay the woods resound with his maledictions, and there is no doubting his entire willingness to murder the owl in cold blood if only he were able.

GRAY JAY; CAMP ROBBER; WHISKEY JACK

(Perisoreus obscurus griscus)

Description.—About the size of a western robin; length about 11 inches, wing about 5¾ to 6 inches. Adults with top of head and back of neck blackish, forehead white, the rest of the upper parts brownish gray; feathers of back with white shaft streaks; tail only slightly if at all tipped with white; underparts white. Young dull sooty brown, darkest on head, browner below.

Identification.—The absence of crest, and combination of dark brown head, grayish back, and whitish under parts characterize this bird.

Occurrence.—Throughout the forested area of the park, from the boundaries to an altitude of 5,500 feet. Perhaps most common in the Canadian Zone, between 2,500 and 4,500 feet.

Habits.—The vocal versatility and freedom from shyness of the gray jay, together with his occurrence in the deep woods where other birds are scarce, help to sustain his reputation as one of the park's most interesting bird citizens. The bird is likely to be heard, first, in the upper branches of the firs or hemlocks at some little distance. In a moment, perchance, a wisp of gray smoke seems to float into camp and there is the saucy whiskey jack, very quiet now, perched on a branch of the tree to which the camp table is nailed, and not 6 feet from where you are sitting. Cocking his bright eye at you in a knowing manner, he scans you with much circumspection. Then down he drops, as likely as not, right onto the table, and before you know it has seized a piece of butter from a plate at arm's length and made off with it! Caught in the very act, he will look at you with all the boldness in the world, as if to say: "Well, what are you going to do about it?" By this time three or four more of the birds

are waiting for a turn. Scraps of meat, bacon rind, bread, potatoes, butter, oatmeal, or almost any other foods are prized. When one breaks camp a company of four or six gray jays is usually on hand, patiently waiting to pick up any scraps which may be left over. Sometimes, but not often, the birds are shy.

Camp robbers have a truly impressive variety of calls and whistles. One call is of a conversational character resembling a minor note of the robin. A cackling note *whut whut kadakut* is sometimes given. Very unusual ejaculations are their *retezzzt*, *ritizzt* or *reckekekekz*. Their whistled calls may be rendered *wheet wheet*, *tseeuk* or *wheeup*, and very commonly *wheeoo wheeoo*. The notes are clear and can be heard for some distance through the forest.

Gray jays are great wanderers. Not infrequently several days will pass by with no sign of them. Then almost without warning a

FIG. 85.—A gray jay becomes friendly with Park Ranger J. B. Flett. (Photograph by H. L. Dillaway. Courtesy National Association of Audubon Societies)

company will appear and forage about the commissary, retiring shortly to the near-by woods.

For some years J. B. Flett has made a practice of feeding the gray jays at Longmire. A flock of 8 or 10 makes their headquarters at his cabin. At first they remained during the winter months only migrating to the high mountain parks in April. Now they remain the year through, building their nests and raising their young in near-by fir trees. After severe storms they come to the windows and look in. At such times they follow Flett in through the door when he goes to get them food, and often alight on his shoulders, back, or hat, begging for something to eat.

> They often stand about a dish of food perfectly satisfied and without touching it until you approach them. On the instant they begin diving into it as if doing you a special favor by eating your "old grub." (Flett, in letter.)

They are very jealous and have many a severe family fight. As a rule no two camp robbers will eat out of the same dish, though at

other times friendly enough. They do not like to have the chipmunks too close to their food supply, either, and often combine forces to drive them away. The Steller jay and varied thrush are admitted to their company on equal footing, but woe be to the owl or the hawk that invades their preserves.

When food is scarce the camp robbers sometimes visit the garbage pile. They are fond of dead mice, often stripping off the skin before eating them. Fresh meat of any kind is relished also. Ben Longmire found a nest of young juncos on a small tree which had to be cut down to make way for a new trail. He removed the nest with the young birds to another tree in plain sight so that the parent birds might find the young. The camp robbers carried off the young birds and devoured them. In some localities they are said to be called butcher birds.

One day as Flett was preparing for a winter trip a gray jay alighted on one of his snowshoes and began tugging at the leather thongs, but the bird soon discovered his mistake.

The plumage of the gray jay seems loose and fluffy, but the feathers are thickset and the protection evidently adequate, for the jays are found in the high parks (5,000 to 6,000 feet altitude) even in winter. The snows are extremely heavy and occasionally the trees and even the rocks are encased in glare ice. It is not strange that at such times the birds show signs of starvation.

NORTHERN RAVEN

(*Corvus corax principalis*)

Description.—Size, large; length, 21½ to 26½ inches; wing, 15 to 18 inches. Plumage black, glossed with lustrous purplish, tinged with dull greenish on belly; feathers of throat long and narrow, distinct from one another; feathers of neck dull gray at base.

Identification.—The raven is not likely to be confused with any bird except the crow. From the latter it is distinguished by its larger size—the crow averages about 19 inches in length, the raven 21 to 27—its harsher call note, its somewhat slower and more ponderous flight, and the lanceolate feathers of the throat.

Occurrence.—Said to be common in the park, from the boundaries to timber line, probably occurring most frequently on the west and south sides.

Habits.—While often encountered inland, the raven is more common along the seacoast. Owing to its unusual cleverness, the Indians of southern Alaska have attributed to the raven much power and influence, have woven many interesting stories of it into their tribal folklore, and have even given it a conspicuous place in their totems. Owing to the veneration with which the bird is regarded by these Indians, it is not molested and is abundant about their villages.

Aside from two ravens heard at Longmire in midsummer, no individuals were observed by our party until September 8, when a pair flew northward over Sunset Park, their hoarse croaks announcing their approach long before they could be seen. After exploring a near-by ridge for a short time they returned southward. After this date ravens were observed at intervals on the west and south sides of the park.

At Paradise Park, September 22, a flock of 22 ravens were seen high in the air, worrying an eagle, which, however, appeared to pay little attention to them. They drifted about for half an hour or more, seeming to enjoy the skylarking.

Miss Crissie Cameron, of the Mountaineers' Club, saw numbers of ravens January 1, 1920, flying over the Tatoosh Mountains and Paradise Valley.

FIG. 86.—Young raven, Burns, Oreg. This bird has not acquired the jaunty and self-confident air of the adult. (Photograph from life by William L. Finley and H. T. Bohlman)

WESTERN CROW

(*Corvus brachyrhynchos hesperis*)

Description.—Length 16 to 20 inches, wing about 12 inches. Black, whole plumage glossed with violet, more strongly on upper parts, feathers of throat short, blended.

Identification.—Usually the smaller size of the crow serves to distinguish it from the raven. The crow's call note is a characteristic *caw*, while that of the raven is a hoarse croak.

Occurrence.—An occasional visitor in lower portions of the park.

Habits.—Investigations by the Biological Survey show that, from man's standpoint, the crow's record is a mixture of good and evil. The counts against it are serious, and include a fondness for corn and certain other crops, as well as for beneficial amphibians, reptiles, poultry, and wild birds. In its favor, however, are its activities in consuming injurious insects, crustaceans, rodents, and carrion. While reduction in numbers of crows is permissible where they have become too numerous, still, since its capabilities for both good and harm are great, it is thought that extermination of the species might have serious consequences.

The crow is reported by J. B. Flett to occur occasionally at lower levels in the park.

CLARK NUTCRACKER [12]

(*Nucifraga columbiana*)

Description.—Somewhat larger than a western robin; length 12 to 13 inches, wing 7 to 8 inches. Bill cylindrical, wings long and pointed, folding to the end of tail; adults with body ash gray, whiter on forehead and chin; wings black, with white patch on secondaries; tail with middle feathers black, outer ones white. Young similar, but colors duller and upper parts brownish gray; underparts brownish ash indistinctly barred.

Identification.—One can tell this bird by the ash gray body plumage, black wings with white patch, and black tail with white margins. The rounded wings give the bird a jerky manner of flight, which is one of its conspicuous traits.

Occurrence.—In the open Hudsonian Zone above the heavy forest, from 5,000 to 7,300 feet, easterly in the park. Most abundant in Glacier Basin, but found on the south side of the mountain west to Indian Henrys Hunting Grounds, and on the north side to Chenuis Mountain and Tolmie Peak.

Habits.—Among the specimens secured by Meriwether Lewis and Captain Clark on their celebrated transcontinental trip of exploration in 1803–1806 were examples of the nutcracker. The bird was later named in honor of Captain Clark by the ornithologist Alexander Wilson. The nutcracker is not unlike the crow in habits, although widely different in color. In localities where the bird is abundant the harsh call notes, *chaar, chaar*, attract immediate attention. The nutcracker population becomes most conspicuous when the young have left the nest. The husky youngsters appear quite as large as their parents, and their squawking calls fill the air. They follow the adults with a persistence truly wonderful, awakening, the echoes with their stentorian teasing. Presently the parent plunges its bill into the open mouth of the young one, and there ensues what appears to be a struggle for life or death. There is of course no occasion for concern, for this, in nutcracker society, is the orthodox method of feeding the young. The process of regurgitation complete, the participants seem to feel better all around. The respite must seem all too brief to the parent, however, for in a

[12] Capt. William Clark (1770–1838), the celebrated American explorer who, with Meriwether Lewis, crossed the continent from St. Louis to the mouth of the Columbia River in 1803–1806. He became a brigadier general and later governor of Missouri Territory.

FIG. 87.—Clark nutcracker, Glacier Basin. Note the white on wings and tail. From specimen posed in natural habitat. (Photograph by William T. Shaw, State College of Washington)

short time the young bird is apparently as hungry and as noisy as ever.

About camps or settlements the nutcracker becomes somewhat familiar, for it is very fond of scraps from the table; but it never exhibits the freedom from shyness which distinguishes the whiskey jack or even the Steller jay.

The nutcracker appears to be wholly absent on the west side of Mount Rainier, and is obviously most abundant in the Glacier Basin country on the northeast side, becoming gradually less numerous as one swings around the mountain either to the north or south.

WESTERN MEADOW LARK

(*Sturnella neglecta neglecta*)

Description.—Size about that of a western robin; length of male about 8¼ to 10¼ inches, wing 4½ to 5 inches; length of female about 7¾ to 9 inches, wing about 4 to 4½ inches. Adult male in breeding plumage has the crown with a median buffy stripe; yellow spot in front of eye; a buffy line over the eye; rest of upper parts grayish brown, with buffy white streaks and black streaks and bars; middle of back heavily marked with black, and tertials, rump, and tail heavily barred; outer tail feathers mainly white; underparts bright yellow, yellow of throat spreading over cheeks; crescent on breast and spotting on sides black. The adult female in breeding plumage is similar, but paler, with the yellow restricted. In winter adults have upper parts lighter, because of the unworn light tips and edgings of feathers; black and yellow of underparts also veiled by light edgings.

Identification.—The combination of black shield on yellow breast, with short tail and ground-loving habit, identify the meadow lark.

Occurrence.—Apparently a casual fall visitor, its inclusion as a bird of the park being based on the sight of a meadow lark at Grand Park (5,600 feet), August 20, by Wallace Newsom, former park ranger.

Habits.—The habits and occurrence of this bird within the park remain to be worked out. There is no obvious reason why it should not be commonly found on the spacious grassy acres of Grand Park and in other regions of like altitude, where it might even breed. In Colorado there are records of the bird nesting to 9,000, and even 9,700 feet, altitude.

BREWER BLACKBIRD

(*Euphagus cyanocephalus*)

Description.—Bulk about half that of a western robin; length of male about 8½ to 9¾ inches, wing about 4¾ to 5¼ inches; length of female about 7¾ to 8¾ inches, wing about 4½ to 4¾ inches. The adult male in summer is glossy greenish black, head and neck purplish black. In winter the adult male is similar to the summer male but more highly glossed. The adult female in summer has head, neck, and underparts brownish gray, faintly glossed with violet on head and neck and with green on underparts; upper parts darker, wings and tail more glossed with bluish green. In winter

the adult female is similar to the summer female, but paler, more buffy gray anteriorly. The immature male in the first winter is like the adult male, but with feathers largely tipped with grayish brown. The young are like the winter females, but feathers with different texture and without gloss.

Identification.—The size and color of this bird, as given, should suffice to identify it.

Occurrence.—Reported from Longmire and Paradise Valley only, but probably occurs in similar situations elsewhere in the park. Appears only after nesting.

Habits.—In the fall blackbirds scatter widely from the lower country, some penetrating nearly to timber line on Mount Rainier. At Paradise Valley we saw several individuals stalking about in their usual stately manner looking for worms or grubs in freshly

FIG. 88.—Brewer Blackbird, Santa Monica, Calif. (Photograph from life by William L. Finley and H. T. Bohlman)

turned earth where excavations were going on for a new building. J. B. Flett says the birds occasionally appear on the meadow at Longmire, but never remain for long.

BRITISH COLUMBIA EVENING GROSBEAK

(*Hesperiphona vespertina brooksi*)

Description.—Length about 6½ to 7¼ inches, wing about 4 to 4½ inches. Adult male with forehead and line above eye bright yellow; crown, wings, and tail black, wings with large white patches; rest of upper parts olive, grading through yellowish green to yellow on rump; underparts greenish yellow, becoming lemon yellow on under wing and tail coverts. In the adult female the prevailing color is yellowish or yellowish brown; the throat is bordered by dusky; and there is a whitish patch on the wings. The young are

similar to the female, but are duller and have the markings less defined.

Identification.—The clear whistled *peep* or *peeup*, heard far more frequently than the bird is seen, is undoubtedly the best single field character. The gaudy color of the males, far from being conspicuous, is a camouflage of extraordinary effectiveness, though the white on the wings is so arranged that it oscillates when the birds are in flight, and at once attracts attention. If seen close at hand, the bird can be told by its color, but one must usually rely on the call note, chunky form, and stout light-colored bill.

Occurrence.—Not uncommon in the wooded portions of Canadian and Hudsonian Zones, between altitudes of 2,700 and 5,500 feet. Abundant at Longmire, and seen at Owyhigh Lakes, White River Park, Spray Park, St. Andrews Park, and elsewhere.

Habits.—The characteristic whistle of the western evening grosbeak brings delight to the heart of every mountaineer who is also a bird lover, for it is reminiscent of other camps amid the pleasant parks and forests of the mountains of the West.

The strong conical bill at once identifies the bird as a seed eater. In winter, as a matter of fact, seeds and buds do form its principal food supply, but in summer it gives its attention chiefly to insects.

Occasionally, forced down by stormy conditions or lack of food, the bird appears in the lowlands and even invades towns, hopping about on the lawns, and especially concentrating in and beneath maple trees, seeds of which form a favorite food. The flocks of grosbeaks, chirping and hopping about on the ground under these trees, present a scene of the greatest animation and industry. As the birds are of irregular appearance, they are the objects of much attention from residents.

We found the birds broadly distributed about Mount Rainier, where they were probably nesting, as young of the year were taken at Spray Park on August 29. During September companies of half a dozen birds were frequently observed on the west side of the mountain, flying south. Since its movements from year to year are somewhat erratic, a careful watch for the grosbeak should be kept during successive seasons at Longmire Springs and if possible at other park localities.

CASSIN PURPLE FINCH [13]

(*Carpodacus cassinii*)

Description.—Size of an English sparrow; length about 5¼ to 6¼ inches, wing about 3½ to 3¾ inches. Adult male with top of head with squarish patch of bright crimson; rump dull rose pink; back and scapulars dull pinkish brown, sharply streaked with dark brown; underparts pale pink, fading to unstreaked white on belly; lower tail coverts usually conspicuously streaked with dusky; wing feathers edged with reddish; tail much shorter than wing, deeply emarginate. The adult female has the whole body

[13] Named in honor of John Cassin (1813–1869), an American ornithologist. He resided many years in Philadelphia, and was one of the most prominent members of the Philadelphia Academy of Sciences. He was the author of numerous papers on natural history, chiefly birds.

streaked with dusky; ground color of upper parts olive-gray, of underparts white. The young are similar to the female, but the streaks on the lower parts are narrower and wing edgings more ochraceous. The young male retains his streaked gray color until his second winter, when he assumes for the first time the crimson colors of maturity.

Identification.—Both male and female are more sharply streaked on the back than in the California purple finch, which may also occur in the park. Its size and crimson coloration, with the conspicuous streaking and song similar to that of house finch (linnet) help to distinguish the bird.

Occurrence.—In Hudsonian Zone only, usually between altitudes of 5,000 and 6,500 feet.

Habits.—The open park country, with its level spaces and gentle slopes, its grass and flowers, and its clumps of firs and hemlocks, is the home and habitat of the purple finch. Here the bird builds its nest and rears its young. The bird was not abundant, and when found was shy and difficult to approach.

On August 8 a company of adults and young was observed at Glacier Basin, on the northeast side of the park. At this date the immature birds were still being fed by their parents. Young birds were seen also at Sunset Park a month later. The purple finch was found at Reflection Lakes (altitude 4,900 feet); and also at or near timber line, both on Mareus Peak and Burroughs Mountain. An unusually high record in the park was that of a flock of 25 to 50 seen August 21 flying over Mount Ruth (8,700 feet), apparently migrating or preparing to do so.

In winter the Cassin purple finch is a not infrequent visitor in the valley lands of eastern Washington. If the weather be cloudy and the wind raw, the bird remains silent; but only let the sun shine through and its rich warbling song is heard. Like many mountain birds it is tame and unsuspicious. (Shaw MS.)

Persons living in warmer portions of the West will be struck by the resemblance both in color and song between the purple finch and the house finch or linnet.

AMERICAN CROSSBILL

(*Loxia curvirostra minor*)

Description.—Size of an English sparrow; length about 5 to 6½ inches, wing about 3 to 3¾ inches. The adult male is dull red, generally brighter on rump; gray showing through on underparts; feathers of back indistinctly streaked; wings and tail plain dusky. The adult females are olivaceous, often shading to bright yellow. The young are streaked, on an olive-gray ground. The young male passes through a plumage stage in which it is mixed red and yellow.

Identification.—The note of the American crossbill may be described as a low, strong note like *pink, pink*, usually in two syllables, while that of the white-winged crossbill is weaker, of higher pitch, and of a varying number of syllables. The *pink* or *kimp* call separates the crossbills from any other bird. Distinction between the two species in the field, except at close range, is impracticable.

Occurrence.—From park boundaries to timber line.

Habits.—It is tantalizing to the nature lover to encounter a bird which persists in keeping on the wing high in air far out of the range of one's vision for details. Unfortunately, this habit is highly characteristic of the crossbill. On occasions we have approached to within 4 or 6 feet of the bird, but such opportunities are rare. While the crossbill is a bird of the upper branches of the conifers, it is so much more conspicuous in flight than at rest that one gets the impression that it is in the air most of the time.

The unique scissorslike bill, in which one mandible is crossed over the other, is one of the most remarkable adaptations among birds. With this efficient instrument the crossbill spreads apart the cone scales sufficiently to permit access to the seeds. In eastern Washington it displays an unmistakable liking for the seeds of the western larch or tamarack (*Larix occidentalis*). Among the leafless branches of this tree the birds are easily seen at their work of harvesting, being expert in negotiating the branch tips wherever cones are to be found, often clinging upside down to get at the desired seeds.

The crossbill is usually of irregular occurrence. Thus it may be abundant in a given locality during one year and scarce the next, depending, probably, on fluctuations in the available food supply. On Mount Rainier crossbills were observed for the most part in companies of four to eight. About noon on July 14, however, a flock of 24 flew over our camp at Indian Henrys, and a few days previously (July 10) a flock of 100 to 150 had been seen at the same place. Crossbills were heard at St. Andrews Park as late as September 16.

WHITE-WINGED CROSSBILL

(Loxia leucoptera)

Description.—Size of an English sparrow; length about 5¼ to 6½ inches, wing about 3¼ to 3½ inches. The adult male is dull rose red, occasionally tinged with yellow or orange; the dark bases of the feathers show through and the back is clouded with black; wings and tail black, wings with two white bands, confluent at upper portion. The adult female is olive green or gray above, indistinctly streaked with dusky; rump yellowish; wings as in male, but not so black; underparts lighter, more tinged with yellowish. The young are similar to the female, but the colors are duller and streaking more pronounced.

Identification.—The call notes differ, as stated under the account of the American crossbill on page 191. The white wing bars constitute perhaps the best field character. Birds so much alike, in the distance, as the white-winged and American crossbills are hard enough to distinguish even under favorable conditions. But when they flock together, as in the present case, the problem is still more difficult.

Occurrence.—From park boundaries to timber line.

Habits.—White-winged crossbills were definitely observed at Longmire and at Indian Henrys, and some of the birds heard at other localities in the park were undoubtedly of this species. It is not unlikely that the birds breed within the park, though definite

records were not obtained. So far as known, the habits of the white-winged crossbill are similar to those of the American.

In winter the birds may simply descend into near-by valleys or actually migrate a short distance southward. But the white-winged crossbill does not occur on the Pacific coast south of northern Oregon, even in winter, while the American crossbill is found south to California.

HEPBURN LEUCOSTICTE; ROSY FINCH

(*Leucosticte tephrocotis littoralis*)

Description.—Size about that of an English sparrow; length about 6 to 6¾ inches, wing about 4 to 4¾ inches. The adult male in summer has bill black; crown black, bordered behind and on the sides with gray, which spreads down over the sides of head, sometimes covering all but black frontal patch; general body color deep chestnut brown, lighter, and with blackish streaks on back; belly, rump, upper tail coverts, wings, and tail more or less tinged with pink. The adult male in winter has the bill yellow, tipped with blackish; brown feathers edged with whitish; and black of crown restricted. The adult female is like the male, having the same seasonal changes, but averaging paler and duller. The young are plain brownish, without black or gray on head, or rosy tail coverts.

Identification.—The rosy finch may be distinguished by its darker color alone from the pipit, which is almost the only other bird of similar size occurring in its habitat. The rosy finch also lacks the teeter-tail habit so conspicuous in the pipit.

Occurrence.—On rocky ridges in Arctic-Alpine Zone, between altitudes of 6,500 and 10,000 feet.

Habits.—As Dawson has well said, "Here is the patron saint of mountaineers. * * * Abysses do not appall him, nor do the flower-strewn meadows of the lesser heights alienate his snow-centered affections." (The Birds of Washington, 1909, vol. 1, p. 79.)

Apparently scorning more comfortable surroundings, the rosy finch selects for his home and feeding ground bleak and wind-swept ridges of rock, dizzy crags and precipices. This is one of the hardy quartet of birds (rosy finch, pipit, ptarmigan, horned lark) which is characteristic of the Arctic-Alpine, the highest and coldest life zone on Mount Rainier. One is likely to see the bird on the slopes of Pyramid Peak in the Indian Henrys district; on the lofty pinnacles of the Tatoosh Range; or on the Palisades, in the Sourdough district on the north side of the park. If one follows the Gibraltar route to the main summit of Mount Rainier, he may observe the rosy finch in the vicinity of Anvil Rock and Camp Muir; or, if he chooses to follow Emmons Glacier to the summit, he may find it near Mount Ruth and Camp Curtis, 2,500 to 3,000 feet above timber line. On August 8, 1897, Dr. C. Hart Merriam saw rosy finches feeding on a crumbled ridge perhaps 20 feet down in a large crevasse on Paradise Glacier.

During our visit the birds were often seen in flocks of considerable size, particularly in late summer. At other times individuals or groups of two to four were observed. The *kreek kreek* or *kereek kereek* is often heard before the bird is seen. Usually individuals or small companies seem ever on the move. Only on exceptional occa-

sions is the opportunity given for more than momentary observation. One rosy finch was noted feeding on the flowers of a clump of white heather (*Cassiope mertensiana*) on a basaltic column near the top of a wall 500 feet high in the Palisade district. The curiosity of this bird got the better of his hunger and caution, and he flew to a scrubby fir and surveyed the intruder, commenting the while *peep lip lip, peep lip lip.*

The nest is usually placed in an inaccessible situation in the rocks above timber line. Small wonder that few have ever been found.

As Dawson has remarked, the rosy finch is not dependent on the scanty vegetation of his Arctic-Alpine habitat, since he is able to wrest a living from the very glaciers. (The Birds of Washington, 1909, vol. 1, p. 79.) Flocks of 50 to 200 were noted by our party feeding on benumbed insects on the surface of the snow, the birds moving slowly from place to place, those of the rear guard rising at intervals, flying forward, and alighting in the van. Dr. A. K. Fisher found the birds feeding on benumbed grasshoppers on snow fields near timber line in Paradise Park during the summer of 1897. They were also eating the leaves of *Saxifraga tolmiei.*

There is a streak of the pugnacious in the rosy finch. One pair of birds was seen chasing a sparrow hawk. Later a flock of 100 birds was observed in vigorous pursuit of a Cooper or sharp-shinned hawk. Theirs was no more, however, than the courage of numbers, for when the hawk made a dive through the flock the finches gave way with alacrity.

In winter the rosy finch leaves the high mountains and descends to the lower plateaus. Being unusually tame and confiding at this season, he readily adapts himself to civilization and will come to feeding boxes and even window sills. The plumage of brown and rose pink is highly attractive at short range. The call notes and subdued musical spring song are most pleasing. As the season advances the pinkish tinge of winter deepens to a rich reddish rose, due to the wearing off of modifying feather tips; and the beak, in winter yellowish in color, changes to black.

PINE SISKIN

(*Spinus pinus pinus*)

Description.—Size of a western goldfinch or "wild canary": length about 4¼ to 5 inches, wing about 2¾ to 3 inches. Adults with whole body finely streaked with brown, on brownish ground above, on whitish below; often with two whitish wing bars; basal parts of principal wing and tail feathers pale yellow. The young have upper parts mustard yellow, tinged with brownish olive, feathers streaked, except on belly; wing bands and patches brown.

Identification.—The less secretive habits of the pine siskin, with the longitudinal streaking and shrill call notes, distinguish the bird from certain warblers with which it might otherwise be confused.

Occurrence.—Found throughout the park, to altitudes far above timber line.

Habits.—This goldfinch of the heights is an attractive little body, both in his dress and personality.

Dr. C. Hart Merriam found a nest with young in a hemlock near timber line on the south side of the mountain the first week in August, 1897. We noted parents caring for young on August 8.

The siskin, as is well known, is of an exceedingly sociable disposition. He apparently regrets the necessity of giving up the flocking habit even for the nesting period, and as soon as possible gathers with his relatives, friends, and acquaintances in companies ranging from a few to several hundred individuals. In fact, one may encounter the birds in small or larger flocks at any time of year, in spite of nesting activities. The bona fide flocking following nesting does not begin until the last of July.

The flocks may be seen circling overhead or perching on heather banks, snow fields, rocks, or conifers, continuously in motion, and usually conversing in the pleasing siskin language as they industriously work or play together. Weed seeds, buds, and other plant parts in season are a large item in their dietary, but that they habitually eat insects of several kinds is perhaps less well known. Their actions on the snow fields resemble those of the rosy finch. At times, when feeding, they remain so quiet as not to be noticed. Suddenly startled, they rise in unison.

> While riding one day through the deep woods I was surprised to see scores of siskins spring up from the forest floor. They flew merrily skyward, like leaves before a tempest. They had been feeding upon the seeds of the great hemlocks on either side of the trail. The birds are somewhat erratic in their movements, being most abundant in good conifer seed years. (Shaw MS.)

While in close flock formation on the snow or elsewhere a low *chit chit chit* is uttered quite rapidly. Other conversational notes are *chik chik chuk*, or *tee too tooo*, and *too queek!* Their principal call note in flight is a *shr-reet!* or *sooeet!* with rising inflection. In one flock observed the birds were so numerous and flew in such dense masses that their wings made a noticeable fluttering sound. During dull and foggy weather the birds usually remain quiet, though late in September they were active in a snowstorm. In winter they may be abundant about towns and villages in the lowlands. They are sure to be attracted by sunflowers in the back yard, and their sprightly ways and spirited call notes add not a little cheer to the short days.

Adaptability to a wide range of conditions is one of the siskin's most obvious characteristics, although the flower-covered subalpine parks at 5,500 feet altitude are centers of abundance, the birds are common at Longmire, and, as already indicated, are frequently noted in the deep woods. As we arose, shivering, from our beds at Camp Curtis, 2,500 feet above timber line, 9,000 feet altitude, August 7, preparatory to attempting the ascent of Mount Rainier, a flock of 16 flew overhead; and later in the day, when we had attained approximately 11,000 feet altitude on the crevassed surface of Emmons Glacier, a dead siskin was found. So far as known, this is the highest record for any bird on Mount Rainier.

WESTERN SAVANNAH SPARROW

(*Passerculus sandwichensis alaudinus*)

Description.—Size about three-fourths that of an English sparrow; length about 4½ to 5½ inches, wing about 2½ to 3 inches. Adults

have crown stripe and line over eye well marked, the latter white or with a yellowish tinge; upper parts grayish brown, streaked with black, the streaks in sharp contrast to feather edgings of whitish, grayish or buffy; underparts white, sometimes, especially in fall and winter, tinged with buffy on sides and chest; sides of throat, chest, sides, and flanks streaked with blackish; longer under tail coverts with concealed streaks. The young are similar, but have the light streaks of the upper parts buffy, the dark streaks of the lower parts less defined, and line over eye usually without yellow.

Identification.—These sparrows are distinguished by the black streaks on the upper parts, in connection with the distinct line over the eye and median crown stripe.

Occurrence.—A migrant in the park, noted by our party between altitudes of 4,000 and 6,000 feet on the west side.

Habits.—If you stalk boldly through the thick grass of the wild hay meadow you are more than likely to flush a small and inconspicuous bird, which will fly low over the grass and soon drop to the ground and disappear. You may be able to scare him up again, in which event the mannerism is repeated. At the proper season you are likely to be favored with a meadow solo, sounding as if some tiny bird, of rather weak voice, were imitating a song sparrow. This modest meadow denizen is the Savannah sparrow.

After nesting in the lowlands some of these birds evidently make a trip to Mount Rainier National Park, where they appear on the high meadows from 4,000 feet nearly to timber line, and from Mountain Meadows on the north to Ararat Ridge and Paradise Valley on the south. At all times shy and inconspicuous, the Savannah sparrow during this season is more than usually unobtrusive. Individuals were seen running furtively along a log beneath a scrubby alpine fir in Spray Park, in the lush grass of the Mountain Meadows, on a verdant slope near the summit of Mount Wow, and on a sidehill near Alta Vista above the hotel in Paradise Park. Usually the birds were alone, or at most in pairs. By the middle of September small flocks were seen frequently in company with pipits.

GAMBEL SPARROW; INTERMEDIATE SPARROW[14]

(*Zonotrichia gambelii*)

Description.—About the size of an English sparrow; length about 5¾ to 6½ inches, wing about 3 to 3¼ inches. Upper parts grayish brown, streaked lengthwise with dusky, top and sides of head striped with black and white, white median stripe usually as wide as adjoining black stripes; white line over eye running to base of bill; edge of wing white; underparts plain gray; rump brown. The adult female is like the male, but usually has the median crown stripe narrower and grayer. The young are like the adults, but have the head stripes brown and buffy instead of black and white; underparts buffy, and chest, sides of throat, and sides streaked.

Identification.—The conspicuous black and white striping of the top and sides of the head separates the adult Gambel sparrow from

[14] William Gambel, M. D., in honor of whom this bird was named, was one of the earlier ornithological explorers of the West. Born about 1820, he died at Roses Bar, Calif., Dec. 13, 1849, "after a hairbreadth escape from the privations which resulted in the death of most of the members of Captain Boone's party crossing the Sierras in the winter of 1849." (Dall, Spencer Fullerton Baird, a biography, 1915, p. 131.)

any other bird in the park. The young are less easily distinguished, especially when occurring in the same flock with the golden-crowned sparrow.

Occurrence.—A migrant in upper Canadian and Hudsonian Zones, chiefly between altitudes of 4,000 and 6,500 feet.

Habits.—The eagle is emblematic of majesty and power, the crow of craft and knavery, and the thrush of evening harmony. The Gambel sparrow is symbolic of sociability and happiness. Shunning the deep forest, the Gambel sparrow is found in open brushy places; and one is as likely to encounter him in the shrubbery of the city park as in the willows of the mountain meadow. In such places he is wont to gather in some numbers, and on a sunny spring day following a rain will fill the air with melody. His song, while not unusually powerful, is full of optimism and good cheer.

While the migration lasts there is scarcely a stump or projecting snag but has its sparrow. If unmolested, the birds scatter over the open spaces searching for weed seeds, flying to cover in the brush

FIG. 89.—Golden-crowned sparrow, Everett, Wash. (Photograph from life by Mrs. S. E. Thayer)

if startled. One bird, usually an adult, will appear on an outstanding branch, his crown feathers elevated and his whole attitude bespeaking alertness. A momentary inspection complete he retreats to shelter.

On September 4 the first Gambel sparrows, all immatures, were observed in Sunset Park. From this time on the birds were common, in the scrubby firs and hemlocks of timber line, as well as in the azalea, mountain ash, and willow brush of the meadow borders. No adult birds were seen for a week after the first immatures appeared, but as the season advanced they became more numerous. The Gambel sparrows were often found in flocks with golden-crowned sparrows, juncos, and Lincoln sparrows.

GOLDEN-CROWNED SPARROW

(*Zonotrichia coronata*)

Description.—About the size of an English sparrow; length about 6 to 7 inches, wing about 3 to 3¼ inches. Color, except crown, much like that of the Gambel sparrow. Adult golden-crowns have

the crown inclosed by black stripes, with median stripe yellow in front, ash gray behind. The young have the black crown stripes replaced by brown streaked with black, and the median stripe dull brownish yellow flecked or streaked with dusky, the ash gray wanting.

Identification.—It is difficult to identify the less conspicuous sparrows in the field. It is particularly hard to distinguish the golden-crowned sparrow from the immature Gambel sparrow, the difficulty being accentuated by their habit of flocking together. The song of the golden crown is distinctive, and on close view one can sometimes make out the difference in the crown markings.

Occurrence.—A migrant in upper Canadian and Hudsonian Zones, between 4,000 and 6,500 feet.

Habits.—The habits of the golden-crowned sparrow closely resemble those of the Gambel sparrow. The first individuals were seen at Sunset Park on the 2d of September. After this they became more and more plentiful, occurring in scores or even hundreds in the moist subalpine meadows, and greatly outnumbering the Gambel and Lincoln sparrows. They were also common in the scraggly trees at timber line; and we noted many in the huckleberry, alder, and mountain ash brush of lower ridges. In Paradise Park near Alta Vista the birds sought shelter in clumps of heather (*Phyllodoce empetriformis*).

During a snowstorm in Paradise Valley late in September the golden-crowned sparrows, contrary to the case with most birds, were alert and active, apparently little affected by the inclement weather.

WESTERN CHIPPING SPARROW

(*Spizella passerina arizonae*)

Description.—About half the size of an English sparrow; length about 4¾ to 5½ inches, wing about 2¾ to 3 inches. Summer adults have bill black; top of head rufous, sometimes with indication of ashy median line and dark streaking; forehead blackish, cut by median line of white; line over eye white or grayish, bordered below by narrow black eye stripe; back brownish or pale buffy, streaked with black; rump and upper tail coverts gray; sides of head dull gray; underparts white or ashy. Adults in winter are similar, but colors are duller and darker, tinged with brown on lower parts, black on forehead obscure or wanting, crown usually streaked with dusky, bill brown. Young with top of head brownish, streaked with blackish; line over eye buffy, streaked; breast streaked.

Identification.—No other park bird has the top of the head rufous as in the chipping sparrow; the insect-like trill is the most useful field character.

Occurrence.—In the Hudsonian Zone, chiefly on the east and northeast sides of the park, between altitudes of 4,500 and 6,000 feet.

Habits.—The chipping sparrow is one of the most beneficial of birds, for its diet includes caterpillars and other injurious insects as well as weed seeds. Its nest is made of fine rootlets and usually placed in some shrub or bush a few feet above the ground. Fre-

quently the lining is of horsehair, in consequence of which the sparrow is known to some as the hairbird.

The chipping sparrow is fond of open country, probably reaching Mount Rainier principally from eastern Washington by way of the Cascade Mountains. It was common on Yakima Park, which is an area of desolate and arid character, and was several times noted at Glacier Basin also. The first birds were observed on August 7, and it is probable that all seen on the mountain had finished nesting before visiting the park.

The westernmost points in the park where the birds were identified with certainty are Spray Park, where several were observed August 27 with a large flock of migrating juncos in the evergreens at the base of a rock slide, and Longmire, where a number were noted early in September, in company with juncos and Zonotrichias. Chipping sparrows were apparently absent on the west side of the mountain.

FIG. 90.—Junco, often called the snowbird, Jennings Lodge, Oreg. (Photograph from life by William L. and Irene Finley)

SHUFELDT JUNCO [15]

(*Junco oreganus shufeldti*)

Description. — Size a trifle smaller than the English sparrow; length about 5½ to 6¼ inches, wing about 2¾ to 3¼ inches. The adult male has the head, neck, and chest blackish slate, the black chest pattern outlined on the white of the underparts as a black convex; middle of back dull brown; sides pinkish brown; three outer tail feathers with white, outside pair wholly white. The female adult has the black replaced by slaty; crown and hind neck washed with brown, and rest of upper parts brownish; sides and flanks duller; bill in life pinkish, tipped with dusky, and iris dark brown or claret color. In winter the colors are stronger and the feathers of chest tipped with whitish. The young are conspicuously different from the adults, being streaked, on brown above, buffy below.

Identification.—The black head and breast of the junco, strongly contrasting with the white underparts, and the white lateral tail feathers of the bird in flight distinguish it from other sparrows.

Occurrence.—From park boundaries to timber line.

[15] Named in honor of Maj. Robert Wilson Shufeldt, U. S. A., of Washington, D. C., eminent for his contributions to the osteology of birds as well as other branches of science.

Habits.—As one approaches National Park Inn, Longmire, the junco is almost the first bird to be seen, for it is one of the most numerous and universally distributed birds in the park.

On July 5 a nest and four downy young were found in a hanging fern basket at the National Park Inn. A few days later several more nests were discovered at Indian Henrys, although much snow still lay on the ground. The latest nest was found July 25 on the ground 2½ feet from the trail between Bear Prairie and Longmire. The parent bird flushed from the nest. The structure was a cup of weed and grass stems, with coarser portions in the framework, finer in the lining. The inside diameter was approximately 3 inches. Both parents were observed in the vicinity, the female remaining close at hand and keeping up an incessant "*tsut! tsut! tsut! tsut!*" Occasionally the male interjected a protest also, but his interest was not nearly so keen, and he took care to maintain a safe distance.

FIG. 91.—Habitat of junco, Indian Henrys Hunting Grounds, July 11, 1919. (Photograph by William T. Shaw, State College of Washington)

At Reflection Lakes during July many family groups of four to six, and occasionally larger companies were observed. More than once a young junco was the object of attack of some belligerent rufous humming bird, which would pursue the unoffending junco for some moments, harrying the bird unmercifully. The junco, meanwhile, would show every evidence of acute embarrassment.

The trill of the junco is a *tlip tlip tlip tlip tlip tlip*, the syllables rapidly repeated on a monotone. This trill song is perhaps most conspicuous in the dwarfed firs at timber line, in which bleak region it is cheering and delightful. A flight call frequently heard may be rendered *treeet! treeet!*

Adults and young birds were observed throughout the summer. About the 1st of August the birds began to gather in flocks. A

company of 16 juncos was seen enjoying the warmth and brightness of a sheltered rock bank on a certain cold morning. How the birds were conversing sociably among themselves and basking in the grateful rays of the sun, which had appeared quite tardily from behind a depressing bank of fog.

According to J. B. Flett, a few juncos winter in the vicinity of Longmire. On March 22, 1919, they swarmed in his flower garden, where they fed on flower seeds left over from the previous summer. They also came up around the porch and ate with the gray jays.

The birds are common in eastern Washington in winter. Here they beat seeds from straggling weed patches, in time of storm seeking the protection of sheltering dooryard trees and gratefully accepting food scattered for them. As spring approaches their numbers are rapidly increased by others from the south and presently the countryside is alive with them. If disturbed they dash unitedly for the cover of adjacent shrubbery, twittering and showing the conspicuous white areas on the expanded tail.

Soon they begin singing, and their numbers dwindle in the valley. They are traveling to the mountains, some to the Cascades of Washington, others to far-off ranges in British Columbia or Alberta.

RUSTY SONG SPARROW

(*Melospiza melodia morphna*)

Description.—About the size of an English sparrow; length about 5½ to 6½ inches, wing about 2½ to 2⅝ inches. Adults have upper parts rusty olive, the rusty brown and black streaks obscured; chest widely marked with heavy dark rufous streaks; flanks olivaceous instead of tawny. The young have the back dark brown streaked with blackish; underparts whitish or buff grayish; chest and sides buffy or brownish streaked with sooty brown.

Identification.—The short rounded wings and tail help to identify the song sparrow; in addition the conspicuous streaking, particularly noticeable on the sides of the face, the neck, and the forebreast, and the dark spot in the middle of the breast are sometimes tangible field marks. In flight the tail is jerked from side to side, in a wren-like manner. Larger size and absence of buffy chest band separate the song sparrow from the Lincoln sparrow; the broader streaks on underparts, and the absence, both of the yellow line over eye and the yellow band of wing, distinguish it from the Savannah sparrow.

Occurrence.—Found throughout the park in both Canadian and Hudsonian Zones, from the boundaries to 6,000 feet.

Habits.—Song sparrows were common in the alders and underbrush at Longmire, and one was noted on Emerald Ridge, high above the surface of Tahoma Glacier, at an altitude of more than 6,000 feet. The bird is a frequenter of thickets in moist meadows and along streams. It is an enthusiastic songster, and during the early hours of the day in spring fills the willow-grown glens with music. Later, as the sun climbs higher, the bird leaves off singing, and one must look for it low among the swamp shrubs, between tussocks of

grass, or even hopping about in the shallow water. Its nest is built in low bushes, scarcely higher than the grass tops, and, indeed, is sometimes placed on the ground. It is quite possible that the bird had nested within Mount Rainier Park at Longmire Springs, Indian Henrys, Reflection Lakes, and White River Entrance previous to our arrival (July 3). Young birds were more frequently observed than adults. Many of the birds seen had undoubtedly migrated to the mountain from the lower country. A song sparrow was heard singing at Longmire Springs July 3, but after this no more songs were heard until September, when the delicate tinkling fall song was noted at Mowich Lake. Song sparrows were noted at Reflection Lakes in company with Lincoln sparrows and at Paradise Park with Gambel and golden-crowned sparrows.

FIG. 92.—Rusty song sparrow, Dayton, Oreg. (Photograph from life by William L. Finley and H. T. Bohlman)

LINCOLN SPARROW

(*Melospiza lincolnii lincolnii*)[16]

Description.—About three-fourths the size of an English sparrow; length about 4½ to 5¾ inches, wing about 2¼ to 2¾ inches. Adults have the upper parts dark brown and olive, finely and sharply streaked with black; crown with light median stripe; malar region, chest, and sides buffy; sides and broad buffy chest band narrowly streaked with black. Young have the colors more suffused and streaks less sharply defined.

Identification.—Smaller, more slender, paler in general appearance, and with more finely penciled breast than the song sparrow;

[16] Named by John James Audubon after Thomas Lincoln, of Dennisville, Me., who accompanied Audubon on his journey to Labrador in 1833.

separated from the Savannah sparrow by its song and the absence of yellow line over eye and yellow bend of wing; the broad buffy chest band is perhaps the best recognition mark.

Occurrence.—Meadows in the Canadian and Hudsonian Zones from park boundaries to timber line.

Habits.—The Lincoln sparrow is preeminently a bird of swamp and moist meadow, where false hellebore, sedges, and willow brush afford abundant cover. It is one of the shyest and most secretive of its family. While the closely related song sparrow is usually restricted to the Transition Zone, the Lincoln sparrow is a characteristic breeder in the Hudsonian. Both were present at Reflection Lakes (July 16–23), though the Lincoln sparrow was more at home and was singing at intervals, while the song sparrow was silent. By August the song of the Lincoln sparrow had lost its full and well-rounded character. A *chek* call, resembling the monosyllabic call of the junco, was also noticed at this time. During migrations occasional Lincoln sparrows are found with flocks of other birds, such as juncos, Gambel, and golden-crowned sparrows. The bird is not so closely bound at the migratory period by its predilections for meadow and swamp, for we found it ranging quite commonly into mountain ash brush and dwarfed conifers close to timber line.

SLATE-COLORED FOX SPARROW; FOX SPARROW

(*Passerella iliaca schistacea*)

Description.—A trifle larger than the English sparrow, length about 6 to 7 inches, wing about 3 to 3½ inches. Bill thick, back olive gray or brownish gray; underparts white, with numerous wedge-shaped spots on breast and sides; belly more whitish.

Identification.—Thick bill, white underparts sprinkled with wedge-shaped spots, and sharp *chek* call note distinguish this sparrow. The spots instead of streaks beneath separate it from the Savannah sparrow, song sparrow, and Lincoln sparrow.

Occurrence.—From park boundaries to timber line; but the breeding range is uncertain.

Habits.—The fox sparrow is principally a ground-living bird, spending much time beneath sheltering bushes scratching among the dead leaves for insects and weed seeds.

Both adults and young were fairly common at Reflection Lakes the middle of July. Having finished nesting, the old birds had lost some of their nuptial enthusiasm, and the song was much less attractive and powerful than at an earlier period. On July 25 a parent with one fledgling was observed in the willow thickets at Bear Prairie (altitude less than 2,500 feet), 3 miles south of Longmire, and on August 16 another parent and young bird were seen in the matted clumps of alpine fir at the extreme limit of timber (7,000 feet) on the Palisades. Two fully grown young birds with one adult were encountered on Yakima Park August 17. The youngster observed at Bear Prairie uttered a warbler-like teasing call, *tsss-tsss-tsssss*, *tsss-tsss-tsss*, which was given continuously and rather rapidly. The bird was only partially fledged, the tail being about one-third grown.

Both adult and immature remained in the shelter of the thickest willows. The fully-fledged young observed on Yakima Park were still teasing their parent for attention.

FIG. 93.—Fox sparrow or slate-colored sparrow, Reflection Lakes. From specimen posed in natural habitat. (Photograph by William T. Shaw, State College of Washington)

Solitary migrants were encountered late in August and during September. A warbler-like *chek* heard in a clump of azalea near Windy Gap on August 26 led us to a single fox sparrow. The surrounding woods were of the heavy Canadian Zone type. Another

bird, very dark in coloration, was noted in a small hemlock on a steep hillside in St. Andrews Park, September 16. The species was also observed at Paradise Park September 26, and Longmire Springs October 1.

VALDEZ FOX SPARROW

(*Passerella iliaca sinuosa*)

Description.—Approximately the size of the slate-colored fox sparrow. Bill rather long and slender, coloration somewhat reddish; a noticeably ashy tinge on upper parts and on sides of neck.

Identification.—Can not surely be distinguished from the slate-colored fox sparrow in the field. The latter tends to be grayer, while the present form inclines more toward reddish.

FIG. 94.—Pinnacle Peak, Tatoosh Range. In the foreground is the habitat of the fox sparrow. The trees are principally alpine fir (*Abies lasiocarpa*) and mountain hemlock (*Tsuga mertensiana*). (Photograph by William T. Shaw, State College of Washington)

Occurrence.—A migrant, probably to be looked for both in spring and fall.

Habits.—A lone individual of this subspecies was seen in a small hemlock on a steep hillside at the head of St. Andrews Creek (5,500 feet), September 16. It was probably on its way from the nesting grounds in the Prince William Sound region, Alaska, to the winter home in southern California.

OREGON TOWHEE

(*Pipilo maculatus oregonus*)

Description.—Length about 7 to 8 inches, wing about 3 to 3½ inches. The adult male is black, except for white belly, brown sides,

and inconspicuous white markings on the back and tail; the rufous of the sides is very dark. Iris bright red. The adult female is similar, but has the black replaced by dark sooty brown or sooty black, indistinctly streaked with black. The young have the throat and chest sooty, not streaked.

Identification.—The conspicuous black back, head, and tail, contrasting with the white belly and rufous sides, distinguish the towhee.

Occurrence.—Probably breeds in Transition Zone within the park below 3,000 feet; apparently occurs chiefly as a migrant on the west side from the boundaries to 5,000 feet.

Habits.—The towhee, variously known as chewink, marsh robin, or catbird, is a bird of the thicket and leaf-covered ground stratum.

FIG. 95.—Oregon towhee, Everett, Wash. (Photograph from life by Mrs. S. E. Thayer)

Ordinarily remaining well within the shelter of its brushy habitat, it occasionally appears on an exposed dead branch and gives its peculiar *tschschschsch* call note. If startled it dives into the thicket, often uttering a call note somewhat resembling the mew of a cat.

A little patience and care enables one to watch the bird as it searches for food. Hopping industriously over the ground, it pauses at intervals and scratches energetically with a rapid, jerky motion of the feet and legs. The feet are moved synchronously and the dead leaves are briskly pushed aside. On catching sight of the observer the bird dashes for cover, its spotted tail becoming conspicuous as it flies.

After nesting in the lowlands the birds are quite commonly found in the subalpine meadows in the park, where they keep close within the cover of the azalea, mountain ash, and huckleberry brush.

BLACK-HEADED GROSBEAK

(*Hedgmeles melanocephalus melanocephalus*)

Description.—Length about 6 to 8 inches, wing about 3¾ to 4¼ inches. The adult male has the under parts cinnamon brown brightening to lemon yellow on the belly and under wing coverts; upper parts mainly black, with cinnamon brown collar and rump, and sometimes brown stripes back of eye, through middle of crown, and on back; wings and tail black, wings with two white bars and white patch at base of quills, tail with white corners. The male in winter is lighter brown on the upper parts. The adult female has the upper parts blackish brown, streaked with pale brownish or buffy; collar buffy white; wing bar white; underparts dull buffy, yellowish on belly, flanks, and sometimes breast; sides streaked; under wing coverts lemon yellow.

FIG. 96.—Male black-headed grosbeak feeding young. (Photograph from life by William L. Finley and H. T. Bohlman)

Identification.—The male of this bird can readily be picked out by his black head and back and his cinnamon brown underparts; the two white wing bars and the white corners of the tail should help also. The female is less strongly marked, but may be distinguished by her pale cinnamon-brown underparts, indistinct brown collar, and dark brown head, with white line over the eye and buffy whitish median line. When seen at close range the huge black bill is conspicuous. The *eek* call note and the robinlike song also help to identify the species.

Occurrence.—Chiefly or solely in the Transition Zone; noted only in the southeastern portion of the park, three out of the four records being for localities below 3,000 feet.

Habits.—While the male grosbeak sings his attractive full-voiced song from some prominent branch, his mate is covering three or four pale bluish spotted eggs. The nest is a frail platform of twigs and

rootlets. Sometimes the male takes a turn at keeping the eggs warm, and, careless parent that he is, frequently sings on the nest, revealing its presence to passers-by.

The birds prefer a habitat of moderate warmth, where plenty of deciduous timber is to be found. These conditions are fulfilled by the great burn on Stevens Canyon. Our attention was first attracted to the bird by its *chip*, *chek*, or *eek* note. It is evidently of rare occurrence, and was probably nesting on Stevens Creek.

LOUISIANA TANAGER; WESTERN TANAGER

(Piranga ludoviciana)

Description.—Length about 6¼ to 7 inches, wing about 3½ to 4 inches. The adult male in summer has the head and neck bright orange or red; rest of underparts bright yellow; upper parts black, with yellow rump and wing patches. The adult female in summer has the upper parts olive green, back and scapulars grayish; wing bars dull yellowish; underparts pale grayish yellow, becoming sulphur yellow on under-tail coverts; anterior part of head sometimes tinged with red. The young male in his first autumn is like the adult female, but is clearer yellow below and has yellower rump. The young female in the first autumn is like the adult female, but duller; upper parts more brownish olive, underparts washed with brownish olive; wing bars narrower and buff colored.

Identification.—In summer plumage the male, with its bright red head, black upper parts with yellow rump and bright yellow underparts, is easy to identify. The female is not so easy to distinguish; one must rely principally on the olive green and grayish upper parts and the pale grayish yellow underparts. The call notes and song, when once learned, furnish good field characters.

Occurrence.—In the Transition and lower Canadian Zones, from park boundaries to 3,000 feet, where doubtless breeding. As a migrant to timber line.

Habits.—The Louisiana tanager, although not so brilliantly colored as the scarlet tanager of the East, is nevertheless one of the handsomest birds in the park. His full round song, *too! teewhoot! teewhoot! tee whoo!* not unlike that of the black-headed grosbeak, much enhances his attractiveness. Strangely enough, for all his brilliant color, the bird is hard to discern on his perch in the willows, for the pattern blends so harmoniously with his surroundings that he becomes next to invisible.

The tanager family contains more than 300 species, found chiefly in the Tropics, this being one of the few which invade North America. He is among the last birds to arrive from the south and ordinarily does not appear before the leaves are out and spring well on its way.

The nest is usually placed 15 to 30 feet above ground on the horizontal branch of some fir or pine. The eggs are three or four in number, pale bluish green in color, lightly spotted with browns and purples.

The call notes of the Louisiana tanager have been variously rendered *pitic* or *pitictic*. To us he seemed to say *pitalip*, *pitlip*, or at times *pit too*, like the dropping of water.

Birds seen during July were all observed in the lower portions of the park. On August 5 a brilliant male was observed in a scrubby white-bark pine at timber line in Panhandle Gap (7,200 feet), and thereafter tanagers were fairly common above 5,000 feet. The breeding range of the bird on Mount Rainier is strikingly more restricted than in certain other localities, if, as seems evident, the tanager was nesting only in lower portions of the park. In the Rocky Mountains of Colorado, for example, the species breeds from 6,500 to 10,000 feet.

TREE SWALLOW; WHITE-BELLIED SWALLOW

(*Iridoprocne bicolor*)

Description.—Length about 6¼ inches, wing 4½ to 5 inches. upper parts iridescent steel blue; underparts pure white; wings and tail blackish, slightly tinged with green.

Identification.—The shorter wings and their slower movement separate the swallows from the swifts; the tree swallow may be distinguished in the field from the violet-green swallow by the absence of white on the flanks, usually conspicuous from above.

Occurrence.—Four swallows, apparently this species, were seen flying about the summit of Mount Ruth (8,700 feet), on the north side of Mount Rainier, on August 21.

Habits.—The extraordinary powers of flight of the swallows make the birds perpetually interesting. Though some 2,000 feet or more above the last matted alpine firs and hemlocks, it seemed quite appropriate to encounter these creatures of air and sky near the summit of Mount Ruth. What need had they for trees, anyway, except to nest in? And the season for that was now (August 21) some time past. If we could have the benefit of their everyday experience one can only guess what secrets of air ways would be ours.

NORTHERN VIOLET-GREEN SWALLOW

(*Tachycineta thalassina lepida*)

Description.—Length about 5½ inches, wing 4¾ inches. Upper parts green, glossed with violet in some lights; nape with narrow purple collar, rump and upper tail coverts violet shaded with purple; wing and tail quills black glossed with indigo; wing coverts violet edged with green; rump with white patches on sides almost confluent in life; underparts white. The adult female is similar, but smaller and duller. The young are similar to those of the tree swallow, but have feathers of underparts grayish beneath the surface and bill smaller.

Identifications.—Wings broader and slower moving than in the swifts; the conspicuous white flanks of the violet-green swallow ordinarily separate it from the tree swallow; but in practice the two are often difficult to distinguish in the field.

Occurrence.—Swallows taken to be this were seen at the following localities only: Canyon Bridge, Muddy Fork of Cowlitz River (3,042 feet), July 23; Longmire (2,761 feet), August 2; Camp Curtis (9,000 feet), August 6. The altitudes of these localities indicate that the birds are likely to be encountered in late summer anywhere in the park.

Habits.—The dress of this swallow, while dignified and even modest in appearance, is one of the most attractive among birds of the park. Like all the swallow kind, the birds are ever on the wing and their graceful circles, made usually at high speed, afford little opportunity for really appreciating their true colors. In fact, so far is this from the case that one may consider himself fortunate if he catches a momentary glimpse of the white flank patches, so as to be able certainly to tell the birds from their relatives the tree swallows.

The violet-green swallow is often found in town or village and will readily build in a nest box provided for it. While constructing the nest it may be attracted by supplying chicken feathers for a lining. So eager for these does it become that it will sometimes snatch them from the air if dropped from a high window. The

FIG. 97.—Young violet-green swallows Portland, Oreg. Note the long wing and short bill and tail. (Photograph from life by William L. Finley and H. T. Bohlman)

bird has a habit of flying high in the early morning twilight of a June day, meanwhile keeping up a constant twittering.

In Colorado the violet-green swallow breeds to 10,000 feet altitude. On Mount Rainier it can not, of course, nest above 6,500 feet, if it is to utilize cavities in trees; but when nesting is past the birds are not so closely restricted by altitude, and may be found circling and sailing 2,000 feet or more above timber line.

CEDAR WAXWING; CEDAR BIRD

(*Bombycilla cedrorum*)

Description.—Length 6½ to 7½ inches, wing about 3½ to 4 inches. Adults with streak through eye velvety black; crest, head, and underparts fawn color, fading to olive yellow on flanks; upper parts fawn color or olive gray becoming blackish on wing quills and tail;

tail tipped with yellow and both wing and tail sometimes tipped with red wax-like appendages. The young are similar, but duller, and have underparts strongly, upper parts lightly, streaked.

Identification.—Usually identifiable by their prominent crests, plump figures, sibilant call notes, and flocking habits.

Occurrence.—Likely to be encountered in the fall anywhere from park boundaries to timber line. There are four definite localities of occurrence in the park—Paradise Valley (probably about 5,500 feet), July 29, 1897 (Dr. A. K. Fisher); Ohanapecosh Hot Springs (2,000 feet), August 3, 1919; Owyhigh Lakes (5,100 feet), August 10; and Sunset Park (5,000 feet), September 3.

Habits.—The courtly grace of the waxwing and the unexceptionable neatness of his costume make him one of the handsomest of birds. The soft smooth colors of his body plumage are worthy of attention; but the red wax-like tips of certain wing and tail feathers are the truly remarkable features of his coloration.

The presence of the bird on a particular mountain slope in summer is a pretty sure sign of the proximity of a plentiful supply of huckleberries, service berries, or other wild fruit. Indeed, the condition of the wild berry crop seems to have much to do with the movements of the waxwing, which, in a given locality, may be abundant one season and nearly absent the next. Insects, as well as berries, are an important part of his diet. While perching high on some dead tree the bird will occasionally dart into the air as if pursuing an insect, returning, presently, to its former perch.

No evidence of the cedar bird's nesting in the park was obtained, though the species is well known to be a common breeder in the Transition and Canadian Zones from central British Columbia to southern Oregon.

In some parts of Washington the cedar and Bohemian waxwings may be found together, particularly in the fall. The cedar bird lacks the dark brown of forehead, cheeks, and undertail coverts, as well as the yellow and white wing markings of its larger relative.

WESTERN WARBLING VIREO

(*Vireosylva gilva swainsonii*)

Description.—Length about 5 to 6 inches, wing about 2½ to 3 inches. Upper parts olive gray; an inconspicuous white line over eye; sides of head pale brownish; wings and tail dusky brown; underparts whitish, shaded with olive yellow on sides. The young have the top of head and hind neck pale grayish buff, the rest of upper parts buffy, wings with buffy bars; underparts pure white except for yellowish tail coverts.

Identification.—Absence of bright colors distinguishes the vireo. It has, in the adult condition, no prominent streaks, bars, or patches, its dress being of a neutral tone throughout. When once its song and call notes are learned, they afford the best field characters; for while it is hard to see in its leafy habitat, it can be heard for some distance.

Occurrence.—Doubtless a rare breeder in Transition Zone, usually below 3,000 feet; later migrating nearly to timber line.

Habits.—The western warbling vireo is one of the least conspicuous birds in the park. If an intimate acquaintance with a pair of

the birds is formed, however, there results, on the part of the observer at least, a rapidly growing friendship. Usually the vireo lacks the shyness of so many woods dwellers, and possesses a large share of curiosity, so that by making an unusual sound, such as squeaking with the lips, one may draw its attention and bring it up close enough for detailed inspection. The querulous call notes, bright eyes, and graceful movements greatly enhance its attractiveness. In color it harmonizes perfectly with its leafy environment.

The bird is characteristically a dweller in the upper branches of the deciduous timber, occurring indifferently in cottonwoods or alders along the stream in the wilderness, or the shade trees of the city street. As the leaves appear in spring the vireo begins to be heard, and, as if growing with them, its exuberance increases as the season advances. The cup-shaped nest, a structure of unusual

FIG. 98.—Western warbling vireo, Portland, Oreg. (Photograph from life by William L. Finley and H. T. Bohlman)

delicacy and beauty, is hung from a horizontal forked twig. It is thinly but compactly built from flat pieces of plant tissue and lined with stems and rootlets.

On Mount Rainier the vireo was commonly heard in the alders along Stevens Creek below Martha Falls, where it was doubtless nesting. The bird was observed also at Ohanapecosh Hot Springs (2,000 feet), and White River entrance (3,100 feet), early enough in the season to suggest summer residence. The migration had begun by August 29, for on that date two birds were observed in alpine firs near timber line.

LUTESCENT WARBLER

(*Vermivora celata lutescens*)

Description.—Warblers are slender, dainty birds, with rather long and slender bills; usually, and especially in the breeding season, they

wear somewhat bright colors. Length about 4 to 4½ inches, wing about 2¼ to 2½ inches. Upper parts olive green, brighter on rump; below greenish yellow; streaks on underparts dull olive greenish; crown with patch of pale chestnut brown, concealed except in worn plumage of late summer. The young in first plumage have the upper parts olive green, wing bars paler or buffy; underparts buffy or straw color shaded with olive on chest, sides, and flanks.

Identification.—The slender form and attenuated bills of the warblers usually distinguish them from the sparrows. The lutescent warbler is separated from the western warbling vireo by its greenish yellow underparts and from the yellow warbler by the admixture of much greenish in the plumage of the lutescent. The other warblers occurring in the park are conspicuously marked, as brought out in the paragraph on "Identification" under each.

FIG. 99.—Lutescent warbler feeding young. (Photograph from life by William L. Finley and H. T. Bohlman)

Occurrence.—Fairly common in the Hudsonian Zone (4,500 feet to 6,500 feet); occurs also, but more rarely, in the Canadian Zone between 3,500 and 4,500 feet. Doubtless a breeding bird in the park.

Habits.—The lutescent warbler was commonly found in the mountain ash, huckleberry, azalea, and willow brush, principally in the open meadow country of the subalpine parks. Warm and sunny south-facing slopes were favorite places of resort, especially after a period of cold or fog. Occasionally the bird was found in patches of Sitka valerian; at other times in the lower branches of alpine firs. His summer foraging seems for the most part to be done within 10 feet of the ground, though in the fall, when migrating, he apparently takes to the tree tops.

The post-nuptial scatter movement was in full swing by the middle of August. At this time the lutescent warbler was often found in the same flocks with Shufeldt juncos, western golden-crowned king-

lets, or chestnut-backed chickadees. It is not unlikely that there is some good reason for this flocking, aside from the companionship involved. The warblers and the juncos, kinglets, or chickadees probably do not compete for food as would one warbler with another of the same species. The individual warbler, attached to a flock of kinglets, let us say, may be the more surely guided to available food. Then, too, differences in alertness of the two or more species concerned may afford greater protection to each than would be the case if they remained separate.

Fig. 100.—Meadow with abundant willow brush, Glacier Basin. A typical warbler habitat. (Photograph by Walter P. Taylor)

CALIFORNIA YELLOW WARBLER

(*Dendroica aestiva brewsteri.*)

Description.—Length about 4 to 5 inches, wing about 2¼ to 2¾ inches. The adult male has underparts yellow, breast and belly streaked with rufous; forehead bright yellow, front of crown often tinged with orange; hind neck and rest of upper parts yellowish green, brightest on the rump; wing edgings yellow; inner webs of tail feathers, except middle pair, light yellow. The adult female and the male in the first autumn are alike; upper parts plain yellowish green, usually darker than in adult male, lighter on forehead and rump; underparts paler and duller, usually unstreaked. The young female in the first autumn is like the adult female, but duller olive

green above, olive whitish slightly tinged with yellow below; under tail coverts pale yellow.

Identification.—Distinguished from other warblers by the general yellow color. In hand the yellow on the inner webs of the tail feathers is distinctive. Sometimes confused with the goldfinch, from which it can be separated by the absence of black in the plumage.

Occurrence.—In the Transition Zone, southeastern portion of the park only, chiefly below 3,600 feet.

Habits.—Like some others of his family the yellow warbler principally affects the leafy foliage of deciduous trees. His brilliant plumage, harmonizing remarkably with his environment, makes him very hard to see, and his nervous activity intensifies the difficulty.

His nest, a compact structure shaped like a cup, may be placed in a shade tree by the roadside, an ornamental tree on the lawn, or even, occasionally, in a shrub. He is also partial to deciduous timber along creeks through the wilderness. The yellow warbler was undoubtedly nesting in the willows and alders on Stevens Creek in the vicinity of Sylvia Falls. Stevens Canyon was his center of abundance in the park, although individuals were observed on Cowlitz Divide and at Ohanapecosh Hot Springs.

AUDUBON WARBLER

(*Dendroica auduboni auduboni*)[17]

Description.—Length about 4¾ to 5½ inches, wing about 2¾ to 3¼ inches. Adult male in spring and summer has the throat, crown patch, and rump yellow; underparts white, yellow, and solid black; upper parts bluish gray, streaked with black; wing coverts with large white patches; tail black, inner webs of 4 or 5 outer feathers with large subterminal patch of white. Adult female in spring or summer is like the male, but duller, with less black on the underparts, and upper parts more or less tinged with brown; underparts grayish white, streaked.

Identification.—The Audubon warbler may be distinguished in any plumage by the yellow rump patch. The "chip" call is also characteristic and usually unmistakable.

Occurrence.—Though probably breeding in the park, this bird was detected only as a migrant, none being observed before August 15. Seen principally on the north and west sides of the park at or above 5,000 feet; one record for Longmire Springs.

Habits.—The Audubon warbler is one of the most notable among birds for the number of its plumages. One familiar with the dull juvenilelike plumage of the bird in winter would scarcely recognize it in its comparatively gorgeous spring dress of contrasted yellow, black, and bluish gray. On the Pacific coast the bird spends the winter in the lowlands, lingering in the spring until the leaves are quite unfolded. With the first hot days it vanishes from the lower country, appearing high in the mountains. Presently its ringing song becomes conspicuous in the coniferous forest.

[17] Named after John James Audubon (1785–1851), the celebrated painter, author, and ornithologist.

At White River Park on August 15 and 16 a half dozen or more Audubon warblers, apparently traveling in a loose flock, were observed in dead stubs on a ridge (5,900 feet) near Clover Lake. After this the birds were noted almost daily at the higher altitudes, apparently preferring fir or hemlock clumps on ridges to any other location. On September 12 one was seen near the ranger's cabin at Longmire Springs (2,750 feet.)

TOWNSEND WARBLER [18]

(*Dendroica townsendi*)

Description.—Length about 4¼ to 5 inches, wing about 2½ to 2¾ inches. The adult male in spring and summer has the head and throat black, except for bright yellow line over eye and yellow streak bordering throat; breast bright yellow fading to white on middle of belly; sides streaked with black; back bright olive green, with black arrow-point streaks; wings and tail blackish, wing with two white bars, tail with inner webs of three lateral feathers white at ends. The adult female in spring and summer is like the winter male, described below, but the black streaking of upper parts and sides is restricted or obsolete; crown sometimes blackish, throat often blotched with black. In fall and winter the adult male resembles the summer male, but has the black obscured; crown and hind neck with olive green edges to feathers; cheek patch with olive green tips to feathers; throat lemon yellow; chest and sides spotted with black.

Identification.—When the bird can be seen at close range the wide band of black or olive on the sides of the head, the green back, and bright yellow breast suffice to distinguish the Townsend warbler in any plumage.

Occurrence.—Park boundaries to at least 5,000 feet and probably to timber line.

Habits.—On entering the great forest of the Pacific Northwest, with its solitude, the deep-shaded grandeur of its brown-barked pillars and its stillness, one can almost imagine himself in a different world. Incessantly repeated, apparently from the very crowns of the trees, comes the song of the Townsend warbler, denizen of upper foliage strata. Found in early summer from Alaska south to the State of Washington, the Townsend warbler finds on Mount Rainier approximately the southern limit of its breeding range. Several individuals were heard between Longmire Springs and the Rampart Ridge on July 3.

As the season advanced the birds became silent and correspondingly less shy. By making an unusual sound, as by squeaking with the lips on the back of the hand, one could now draw their attention, when at an earlier date it was quite impossible. At this time, too, they were foraging at distinctly lower levels in the trees than before.

Like the lutescent warbler, the Townsend was frequently noted in company with other birds, such as western golden-crowned kinglets, chestnut-backed and mountain chickadees, Canada nuthatches, and Shufeldt juncos.

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[18] See note, p. 28.

MACGILLIVRAY WARBLER[19]; TOLMIE WARBLER[20]

(*Oporornis tolmiei*)

Description.—Length about $4\frac{3}{4}$ to $5\frac{1}{2}$ inches, wing about $2\frac{1}{4}$ to $2\frac{1}{2}$ inches. The adult male in spring and summer has the head, throat, and breast slate gray; throat feathers edged with ash; rest of underparts yellow; spot in front of eye deep black; eyelids with distinct white spots; back olive green, sometimes tinged with gray. Adult female in spring and summer is like the adult male, but has the crown, hind neck, and sides of head and neck mouse gray, fading to pale grayish or grayish white on the throat and breast.

Identification.—The gray head, throat, and breast, contrasting with the yellow underparts back of the breast, ordinarily suffice to identify the Tolmie warbler. The first rapid glance suggests the junco, but the yellow underparts and wholly different manner soon enable one to properly allocate the bird.

Occurrence.—As a breeding bird in the Transition Zone along Stevens Creek, below 3,000 feet; as a migrant in the Canadian and Hudsonian Zones, to 6,500 feet.

Habits.—The Tolmie warbler is found in the willow brush or other shrubbery usually at no great height above the ground. The call note or song is often heard when the bird itself is skulking under cover of the thick leaves. At such times the only glimpse of the bird obtained is a momentary one as it nervously passes from cover to cover.

The term "warbler" carries, perhaps, the thought of brilliant melody, but the songs of most of the family are anything but spectacular. The Tolmie warbler, for example, utters a modest *preeta preeta preet*,' with variations, which will be recognized as akin to the song of the yellow-throat. The song seems not to be uttered so frequently as with some warblers.

During July the Tolmie warbler was commonly heard in the tangled thickets along Stevens Creek. Later in the season the bird ranged to the alpine firs at timber line. At this time the song was no more heard, its place being taken by a soft *chik* call. While not ultra secretive, the birds were somewhat shy, and it was often a matter of some difficulty to locate them in their brushy retreats.

GOLDEN PILEOLATED WARBLER

(*Wilsonia*[21] *pusilla chrysceli*)

Description.—Length about $4\frac{1}{4}$ to $4\frac{1}{2}$ inches, wing about $2\frac{1}{4}$ inches. Back olive green. The adult male with crown black; re-

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[19] William MacGillivray (1796-1852), "the greatest and most original ornithologist of his day," born at old Aberdeen, Scotland, and a resident of Aberdeen for the most of his life. He was associated with Audubon in the preparation of the "Birds of America." The warbler now known as *Oporornis tolmiei* was described by Audubon under the name *Sylvia macgillivrayi*, but had been previously characterized by Townsend using the name *Sylvia tolmiei*. The name of MacGillivray is still retained in the common name of the species, while Tolmie's is perpetuated in the accepted specific name.

[20] Dr. William Fraser Tolmie (1812-1886), a medical officer in the service of the Hudson's Bay Co. During the year 1833 and thereafter Doctor Tolmie served at Nisqually House, Puget Sound, and other points in the Pacific Northwest, making valuable contributions to knowledge of the botany and zoology of the region.

[21] This name given in honor of Alexander Wilson (1766-1813), a precursor of Audubon, sometimes called the father of American ornithology. His "Ornithology," the seventh volume of which had been completed at the time of his death, is said to mark an era in ornithological science.

maining surface of head and underparts bright yellow. The adult female sometimes lacks the black crown patch. The young have the black of the crown nearly obscured by an olive wash.

Identification.—The glossy black crown patch serves readily to identify adults of this warbler, except that sometimes the adult female lacks the black cap. The bright yellow color of underparts, forehead, and face usually distinguish the bird.

Occurrence.—As a breeding bird in Transition Zone on Stevens Creek, below 3,000 feet altitude; as a migrant, at least through Canadian Zone to an altitude of 5,000 feet.

Habits.—The pileolated warbler is one of the handsomest and rarest warblers of the park region. To obtain the full effect of his brilliant color one must catch him dealing with a rival, when the blackness of the cap and the rich quality of the yellow seem to be accentuated.

The song, which is repeated at fairly definite intervals, may be phrased *tseek tseek tseek tseek tseek tseek tseek tseek!* The syllables are uttered staccato, the pitch being elevated slightly toward the end of the song.

The birds were singing in alder patches along Stevens Creek the middle of July. Later in summer they were observed in widely separated localities, from Longmire (2,700 feet) to Windy Gap (5,000 feet). At the latter locality two were observed in the azalea brush, attention being attracted to them by their *chek* call note, which was stronger than the similar call of the Tolmie warbler, possessing something of fox sparrow quality.

AMERICAN PIPIT

(*Anthus spinoletta rubescens*)

Description.—Size about that of the English sparrow; length 6 to 7 inches, wing about 3¼ to 3½ inches. Adults in summer have upper parts grayish brown, indistinctly streaked; wing blackish brown, with two buffy wing bars and light edgings; tail blackish, inner web of outside feather largely white, second feather tipped with white; line over eye and underparts light buffy, chin lighter, chest streaked with dusky. Adults in winter are browner above, lighter below, streaks on the breast usually broader. The young are similar, but washed with brown and more distinctly streaked.

Identification.—In the field this bird appears dark above and buffy whitish beneath. A more or less conspicuous lengthwise streaking on the breast is apparent also. The tail appears brownish, with white edgings. The most useful field character is the bird's habit of tipping up its tail.

Occurrence.—Breeds in the Arctic-Alpine Zone above 6,500 feet. Found at least to Camp Muir (10,000 feet); in late summer and fall it descends to lower altitudes.

Habits.—The pipit is a modest bird in color, action, and voice. With the rosy finch, pine siskin, and certain swallows it holds the altitude record for birds in the park. Grassy patches on the windswept areas above timber line are its chosen habitat. Here the nest is placed on the ground, amid the dainty red and white heathers, grasses, lupines, veronicas, louseworts, and phloxes. The eggs are five or six in number, dark brownish-purple in color. Adults and

young were seen by Dr. A. K. Fisher above timber line in Paradise Valley, July 28 to August 5, 1897. A pair observed by our party, August 5, 1919, in Panhandle Gap, was almost certainly nesting in the vicinity. The birds remained in the immediate neighborhood and gave every evidence of concern, if not agitation, walking about with tails teetering; flying off a little distance, returning to perch on a low stone or to continue their promenading; uttering the while a *whist! whist! whist!* which plainly indicated their anxiety. Another call note is *tsink! tsink!* seemingly given to enable the birds to keep track of each other. The pipit is a habitual nester at lofty altitudes. In Colorado it breeds chiefly between 11,000 and 13,000 feet.

Toward the end of summer the pipits gathered in flocks of 15 to 100 and were regularly encountered in the subalpine parks (as Indian Henrys and Paradise Valley) as well as on ridges at timber line.

On September 27 Paradise Valley was enveloped by a snowstorm, which, with the accompanying wind, made the high ridges decidedly uncomfortable and probably depressing even to the pipits which were observed there; for the birds were much quieter and less active than usual.

AMERICAN DIPPER; OUZEL

(*Cinclus mexicanus unicolor*)

Description.—About two-thirds the size of a western robin, length about 7 to 8½ inches, wing about 3½ to 3¾ inches. Bill shorter than head, slender, and compressed; wing short and rounded; tail shorter than wing; claws strongly curved. Adults in summer with whole body nearly uniform slate gray, a trifle lighter below; head and neck faintly tinged with brown. In winter the adults are similar, but the feathers of the wings and underparts are lightly tipped with white. The young resemble the adults in winter plumage, but the underparts are more or less mixed with white and tinged with rusty.

Identification.—No other bird can be confused with the dipper, with its apparently uniform slate-gray color, its wren-like habit of curtseying, and its passion for turbulent streams and waterfalls.

Occurrence.—Along streams and about lake shores from the park boundaries to 6,000 feet.

Habits.—All about is the dark hemlock fir forest, traversed by the tumbling torrent of Paradise River, bearing the melting snow from its source in the glaciers onward toward the big river. We are on a bank near one of the surging waterfalls of the Washington Cascades. Here the Finleys, trying hard for photographs of the water ouzel, have located a pair of the birds and have set up their cameras. The bank is rather steep, and a misstep would precipitate both humans and cameras into a whirling vortex of waters in the rocky basin beneath. But see, there is the mother dipper, perching, her tail continuously bobbing, on one of the rocks of the river just above the fall. She does not like the looks of the intruders, and flies nervously from rock to rock on a tour of inspection, bobbing in first one direction, then another. Shortly, by a quick flutter of her wings, she swerves down in front of the falls and alights on a moist ledge, one which is continuously bathed by spray. Daintily balancing and always curtseying, she quickly runs along the ledge and disappears from view behind the falling waters! We could

FIG. 101.—Water ouzel, Washington Cascades, Paradise River. On rock near waterfall, carrying food to young. (Photograph from life by William L. and Irene Finley)

FIG. 102.—Nest of water ouzel, Eagle Creek, near Cascade Locks, Oreg. (Photograph by William L. and Irene Finley)

imagine an oven-shaped nest "constructed chiefly of moss," placed securely on a shelf of rock under the waterfall. We could imagine further, four or five hungry nestlings, anxiously and hungrily awaiting the parent's return. We decided that the birds must have constructed the nest before the snows began to melt, when the waters of Paradise River were low. Finley found a last year's nest, a typical big mossy ball with a hole in the side, on the opposite side of the stream under a rock at the side of the falls. If we could not see the occupied nest, we could at least watch the birds. Both parents had by this time appeared, though one, probably the mother, was far more attentive than the other.

After remaining out of sight at the nest for some moments she would emerge and with her rattling *zeleleck* call would fly up or down stream. This afforded the camera artists an opportunity of changing position slightly and of preparing for her next appearance.

Finley writes:

> The nest must have been in the dripping water, but the young birds were perhaps nearly grown, so they could survive the flood. With the main current of the falling waters just missing the nest, the young birds would have to wait until they were expert on the wing to ever get out from under the heavy falls. By tying the camera to a small tree just at the edge of the cliff and pointing it down we got some pictures of the old birds going in and out. (Mazama, vol. 5, 1919, p. 323.)

Unfortunately, the slippery ledge where the bird always alighted was below us in the shadow. It became necessary to make the bird pose for her portrait on the well-lighted rocks above the fall. In order to accomplish this a handkerchief was tied on the end of a long stick and an attempt was made, when she approached the nest, to frighten her from the aforementioned moist ledge so she would fly to the rock opposite the camera. One might think that so wild and free a bird as the dipper would be paralyzed with fear at this treatment; but not so this individual, which came to have so little respect for the stick and handkerchief that she permitted herself to be actually prodded off the ledge! But she insisted on getting to the nest regularly come what might. After giving the cramped and quiet observers a wait of some moments, she would often sneak past stick, handkerchief, and all, diving under the waterfall before anyone realized she had returned!

Obviously the water ouzel is well adapted to its stream and lake environment.

Dr. C. Hart Merriam writes (MS.) that, as observed by him on Mount Rainier, the birds possessed two wonderful powers: (1) They can navigate under water; (2) they can hold their own in very swift water without being washed downstream. He asserts that the way they run about in the rapids is simply amazing. They stand on steep slippery rocks, with a thin current of water dashing over them, and even keep their footing on rocks in cascades where water an inch deep is running over with great force. Once in a while the water is too much for them and carries their feet away. At such times they simply set their wings going and hover rapidly while taking another stand. They seem to be continually picking small objects out of the water. Sometimes they walk down a rock into rapid water and duck their head under a few times, then step

out a little farther till their whole body is under except the tail, and then it disappears also. They are evidently feeding on the bottom.

Several birds were observed on the quiet waters of the Tahoma Creek beaver pond. There was considerable current in the pond, and one dipper, attempting to swim against it, was able to keep its place only by bracing against some stiff grass growing on the pond bottom. At this locality (September 18–21) the birds were giving their beautiful song, the full rich notes of which are interspersed with the chattering *rekek* notes which so definitely identify the dipper.

Water ouzels were frequently seen swinging low over the water near the shores of Reflection and Mowich Lakes, apparently as much at home as on the cascading creeks below.

FIG. 103.—Young Seattle wrens, Portland, Oreg. The birds already show the white line over eye which is so conspicuous in the adult. (Photograph from life by William L. Finley and H. T. Bohlman)

The birds evidently remain in the park throughout the winter. J. B. Flett saw a dipper December 29, 1919, near Sluiskin Falls; and Miss Crissie Cameron, of the Mountaineers' Club, observed one in Paradise Valley on New Year's Day, 1920.

SEATTLE WREN; NORTHWESTERN BEWICK WREN

(*Thryomanes bewickii calophonus*)

Description.—Length about 5 to 5½ inches, wing about 2 inches. Bill slender; upper parts rich dark brown, slightly deeper on head; a conspicuous white line over the eye; underparts grayish white, lightest on throat, tinged with brown on sides and flanks; tail black, middle feathers sepia brown barred with black, the rest tipped with gray and barred with brown, outer pair barred toward end with whitish; under tail coverts barred with black.

Identification.—The prominent white line over the eye distinguishes this bird from both the Parkman wren, which lacks the line altogether, and the winter wren, in which the line is present but is light brownish in color. The Bewick wren is larger, and less closely restricted to the forest floor than is the winter wren; its call notes and song are different also.

Occurrence.—Recorded from Longmire only.

Habits.—J. B. Flett has seen the Seattle wren at Longmire Springs. There is no good reason why it should not be found at other localities of moderate altitude on the west side of the park. Like its Colorado cousin, the Baird wren, "It has a melodious song, sweeter and perhaps more musical than that of the house wren." (Sclater, Birds of Colorado, 1912, p. 490.) Its nest is placed in some convenient cavity in a rotten stump, branch, or trunk.

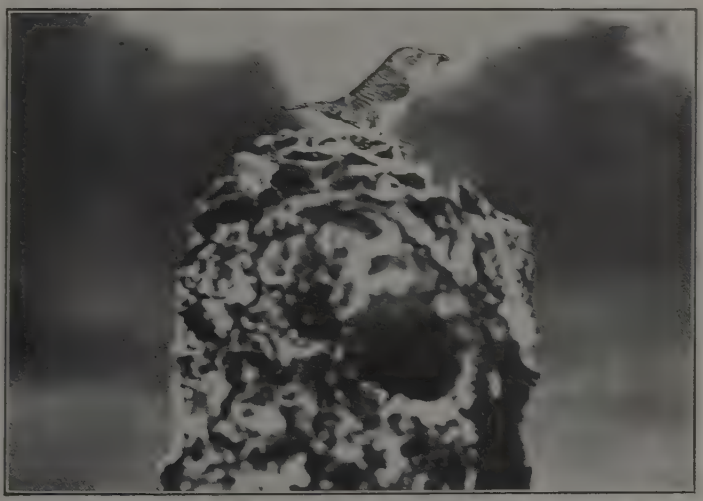

FIG. 104.—Parkman wren, Jennings Lodge, Oreg. (Photograph from life by William L. and Irene Finley)

According to J. B. Flett, the first birds observed at Longmire during the spring of 1920 appeared April 11.

WESTERN HOUSE WREN; PARKMAN WREN; PACIFIC HOUSE WREN

(*Troglodytes aedon parkmanii*)

Description.—Length 4¾ to 5¼ inches, wing about 2 inches. Upper parts dull brown, all but head barred with blackish; tail coverts barred with black and whitish; underparts dingy, lightly barred.

Identification.—Larger and duller brown than the western winter wren; lacks the prominent white line over the eye which is so noticeable in the Seattle wren.

Occurrence.—The only definite record is for Longmire (2,700 feet), but the bird doubtless occurs, probably rarely elsewhere, in lower portions of the park on the west side.

Habits.—The Parkman wren readily adapts itself to human habitations, even deigning to nest in convenient cavities about houses. During spring and early summer its cheerily warbled song is conspicuous and attractive. While it does not travel high in the trees, it is not so closely restricted to the ground stratum as is the winter wren.

WESTERN WINTER WREN

(*Nannus troglodytes pacificus*)

Description.—Smallest of the wrens; length about 3½ to 4¼ inches, wing about 1⅞ to 2 inches. Tail short, outstretched feet reaching far beyond its end. Upper parts dark brown, brighter on rump and upper tail coverts; wings, tail, and often back and rump narrowly barred with blackish; line over eye, throat, and breast light brown; belly and under tail coverts barred; flanks darker.

FIG. 105.—Western winter wren, Portland, Oreg. As much a part of the northwest woods as the hemlocks and firs. (Photograph from life by William L. Finley and H. T. Bohlman)

Identification.—The small size, short tail held almost vertical, absence of conspicuous white line over the eye, and ground-loving habits make easy the identification of this diminutive park resident.

Occurrence.—Abundant resident from the park boundaries to the limit of trees.

Habits.—The western winter wren seems as much a part of the forest floor as the mosses, huckleberry vines, huge logs, and upturned roots of his surroundings. A little brown ball of feathers, he is so quiet and mouselike in his actions that he is easily overlooked. Occasionally as he creeps along the side of an old dead stub or fallen log one must look sharp to make sure of his identity. When the traveler emerges from the dark woods onto the open meadows or well-lighted brushy burns the wrens become much less numerous, for they are fond of shadows. They are often found at a considerable distance from water on some forest-covered hillside. Once,

indeed, they were noted in clumps of alpine firs on an open and well-lighted hillside with a southern exposure.

The real charm of the winter wren becomes apparent during the nesting season. At this time, when all the world is a song and a blossom, he emerges from his brushy shelter and, taking a prominent position on the topmost snag of the brush pile, emits a tiny tinkling warble.

During the first week in August, 1897, Dr. C. Hart Merriam encountered a bird which apparently had a nest in a decayed stump at the upper end of Paradise Park. The bird sat so close it permitted him to stroke its feathers. Family groups with at least three in each were observed by our party on July 21 and August 12.

If the observer remains quiet, and perhaps makes a squeaking sound with the lips on the back of his hand, he can easily attract the midgets to within 3 or 4 feet. Under such conditions a call note is uttered, evidently expressive of curiosity or caution, *tssssss! tssssss!* The usual call note is a *check! chek-chek! chek-chek!*

Thick fog and rain act as depressants of the spirits of the winter wren, as with other birds, though the wren is frequently seen pursuing his quest for tiny insects quite out of the storm in the shelter of some great log. Ordinarily the bird does not venture higher than 6 feet above the ground, but is wont suddenly to issue from beneath a huge mossy log quite close to the observer. If approached he dodges back under the log or slips quietly away in some convenient root tangle.

Winter wrens were common in the shelter of clumps of alpine fir and black hemlock at Indian Henrys Hunting Grounds early in July, while still deep snow lay on the ground. The birds were heard late in December in the same general region by Park Superintendent Toll and J. B. Flett.

SIERRA CREEPER

(*Certhia familiaris zelotes*)

Description.—Size about that of a house wren; length about 5 inches, wing about 2½ inches. Upper parts rusty brown, brightest on rump, dusky anteriorly; pale brown streaks on head, white streaks on shoulders and back; wings dusky with pale brownish spots, underparts whitish; bill slender, wrenlike; feathers of tail strong and pointed.

Identification.—In seeking its insect food on the bark of big trees the creeper hangs on like a woodpecker, its sharp rounded claws being admirably adapted for clinging to the bark and its stiff tail well suited to serve as a brace. Its small size, modest color, and the woodpecker-like attitude distinguish the creeper from any other bird.

Occurrence.—From the park boundaries to 6,000 feet. More abundant than elsewhere in the heavy hemlock-fir forests of the Canadian Zone below 4,500 feet.

Habits.—This tiny bird, with coloration much like that of the bark over which it works, is one of the least conspicuous in the park. Attention will probably be first attracted by its call notes, which are variously rendered *tseek* or *tsoo tseee*. By close observation one may see it on the trunk of some huge fir or hemlock, hitching its way up

the bark, examining all likely cracks and crevices for insects or their eggs or larvæ which it readily secures with its long and slender curved beak. Up it goes until one can scarcely follow its movements. Suddenly relaxing its hold, it drops earthward, gliding almost like a falling leaf, and beginning the climb all over again at the base of another tree. This pilgrimage is repeated indefinitely.

The nest, one of the most attractive bird homes, is placed against the tree trunk, being hidden beneath a protecting slab of bark, usually not over 10 feet above the ground. It is no wonder that the creeper is found chiefly in the big timber, for here alone can be found the sprung slabs of bark which are apparently essential for nesting sites. Fully grow young of the year were observed on August 13. When frightened, the creeper either remains in the higher parts of the trees or crouches in a bark crevice. In either case it is usually quite safe.

The bird is not common anywhere in the park. Its woods habitat is a difficult one in which to make complete observations. The modestly clad bird can easily avoid one's field glass altogether. At best it is difficult to trace the bird in its bark journeys. A close study of the creeper would therefore possess special interest and value.

SLENDER-BILLED NUTHATCH

(*Sitta carolinensis aculeata*)

Description.—Length about 5 to 6 inches, wing about 3¼ to 3¾ inches. Bill slender, straight; forehead, crown and hind neck in adult male with broad band of glossy black; a black transverse collar across shoulders; rest of upper parts bluish gray; black of top of the head strongly contrasted with white of the sides of face, shoulders, and underparts; adult female with top of head grayish.

Identification.—Nuthatches can usually be told from other birds by their trait of perching head down on the trunk or walking about on the lower surface of a branch, apparently with as much facility as in any other manner. Their straight slender bill also helps to identify them. The larger size of the slender-billed nuthatch, with the absence of stripes on side of head, distinguish the bird from other nuthatches. Its clear white underparts contrast markedly with the reddish brown underparts of the red-breasted nuthatch.

Occurrence.—Has been observed only as a migrant, encountered in Hudsonian and lower Arctic-Alpine Zones on the east and northeast sides of the mountain from 5,400 to 7,000 feet.

Habits.—The nuthatches, like the creepers, find their insect food on the bark of trees. They appear just as happy when head down as head up, and are frequently seen clinging to the under sides of branches. The characteristic call note *yang*, *yang*, was first heard August 10 at Owyhigh Lakes, where a nuthatch was located working up and down some dead stubs near camp. The bird seemed restless, and did not linger. Later others were heard, in each case at an altitude of about 7,000 feet, on the Palisades, Dege Peak, and Burroughs Mountain. After nesting in the Cascade Mountains to the east the nuthatches scatter in various directions, some repairing to the watercourses of the lower country, others finding their way westward to the slopes of Mount Rainier.

RED-BREASTED NUTHATCH: CANADA NUTHATCH

(Sitta canadensis)

Description.—Length about 4 to $4\frac{3}{4}$ inches, wing about $2\frac{1}{2}$ to $2\frac{3}{4}$ inches. Adult male with top of head glossy black, side of head with white line over eye and black line through it; underparts reddish-brown; back bluish-gray; wings plain; tail with white patches on outer feathers. The adult female has the black of head replaced by bluish-gray, and underparts lighter reddish-brown. The young are similar but duller.

Identification.—Smaller size, reddish underparts, and white line over eye separate the red-breasted from the slender-billed nuthatch. The nasal *ank ank* is the most useful single field character.

Occurrence.—From park boundaries to timber line; more abundant than elsewhere in the lower Hudsonian and Canadian Zones below 5,000 feet.

Habits.—The nasal *ank ank* of the red-breasted nuthatch is one of the commoner sounds in the park. Often a pair of the birds will approach, obviously curious. They peer at one with their alert bright eyes, and often come quite close, so that their reddish breasts, stout, straight bills, and grayish-blue backs can easily be seen. A squeaking sound made with the lips excites them greatly. The nuthatch does not, like the creeper, use the tail as a prop. Its wiry feet and claws, however, give it strong grasping power.

The red-breasted nuthatch, unlike the slender-billed, is a sociable little body. Solitary individuals are seldom seen. Pairs are perhaps commonest, but groups of four or even six are not rare. The nuthatches frequently join forces wth the chestnut-backed chickadees; and we have noted them in a large loose flock of birds which included not only these species but also mountain chickadees, western golden-crowned kinglets, Shufeldt juncos, and a Townsend warbler.

While commoner than elsewhere in the deep woods below 5,000 feet, one is not unlikely to encounter the birds in clumps of alpine firs and mountain hemlocks nearly or quite to timber line. They were fairly abundant at Indian Henrys Hunting Ground the middle of July, when several feet of snow still lay on the ground.

During a period of cold rainy weather at Sunset Park one individual was seen quietly making a brisk examination of the foliage of an alpine fir. The bird worked with nervous haste, like a warbler. When the sun broke through the clouds the birds were much in evidence, and several groups became obviously active in contrast to their quiet and secretive demeanor during the storm.

The red-breasted is probably the only nuthatch breeding in the park.

OREGON CHICKADEE

(Penthestes atricapillus occidentalis)

Description.—Chickadees are moderately slender birds with rather long tails; length about $4\frac{1}{2}$ to $5\frac{1}{4}$ inches, wing about $2\frac{1}{4}$ to $2\frac{3}{4}$ inches. Top of head, back of neck, chin, and throat glossy jet

black; shoulders and sides of face white, in sharp contrast to black of head and throat; rest of upper parts gray; breast and belly whitish, washed with buffy on flanks.

Identification.—The short bill and conspicuous black and white face markings are characteristic of the chickadees, separating them from the nuthatches, creepers, kinglets, and warblers with which they are often associated. The Oregon chickadee lacks the rufous color of the chestnut-backed chickadee and the prominent white line over the eye of the mountain chickadee.

Occurrence.—In lower portions of the park below 2,700 feet.

Habits.—These chickadees are for the most part confined to the alders, willows, and other deciduous timber along stream courses.

SHORT-TAILED MOUNTAIN CHICKADEE

(*Penthestes gambeli abbreviatus*)

Description.—Length about 5 to 5¾ inches, wing about 2¾ to 3 inches. Forehead, crown, and hind neck black, a prominent white line over the eye; rest of upper parts gray; sides of face white; chin and throat black; remainder of underparts whitish, faintly washed with buffy, particularly on flanks.

Identification.—Tail shorter than in the Oregon chickadee, from which it is also separated by the white line over the eye. Distinguished from the chestnut-backed chickadee by absence of rufous.

Occurrence.—In the Hudsonian Zone, between altitudes of 4,900 and 6,000 feet. Most abundant on the east side of the mountain, occurring westward to Indian Henrys on the south side and Spray Park on the north side. Apparently absent from the west side.

Habits.—The mountain chickadee is for the most part confined to the high country, where it is commonly found foraging in clumps of alpine fir. Swinging from the branches of some snow-laden conifer it is at its best. Being agile of muscle and of unusually alert appearance, it is one of the most pleasing of birds of the alpine region.

Mrs. Bailey says:

> In the usual forms of the whistle either the one long note is followed by two or three short notes—*phoe-de-de* or *phoe-de-de-de*— or else the long note stands between the short notes, as *de-de-phoe-de-de*. (Handbook of Birds of the Western United States, 1917, p. 458.)

Their call note possesses a lisping quality reminding one somewhat of the utterance of the young of the long-tailed chickadee.

Individual mountain chickadees frequently join companies of chestnut-backed chickadees; and on one occasion a mountain chickadee was seen in company with western golden-crowned kinglets, Canada nuthatches, and Shufeldt juncos, in addition to the chestnut-backs.

The mountain chickadee has evidently reached Mount Rainier by way of the Cascade Mountains. It is present in greater numbers on the east side of the mountain than elsewhere. As one travels westward it becomes much lessened in numbers, and on the west side of the mountain is apparently altogether absent.

CHESTNUT-BACKED CHICKADEE

(*Penthestes rufescens rufescens*)

Description.—Size smallest of the chickadees of the park. Little larger than the house wren; length about 4¼ to 5 inches, wing about 2¾ to 2⅞ inches. In adults, throat and broad band on forehead, crown, and neck blackish brown; back, sides, and flanks rich reddish brown; a black line above eye; sides of face white; breast and belly whitish. The young have the top of head, back of neck, and throat dark sooty brown; back dull chestnut tinged with olive; and sides ashy, partly washed with brown.

Identification.—The smaller size, more delicate call notes and more reddish color help to distinguish this bird from other chickadees. It is ordinarily found, too, in the heavy fir hemlock woods, where the others are rare or absent.

Occurrence.—Throughout the park from the boundaries to timber line, 6,500 feet. The heavily forested Canadian Zone, below 1,500 feet, is its center of abundance.

Habits.—Chestnut backed chickadees are perhaps the most abundant birds in the splendid woods about Longmire Springs, Ohanapecosh Hot Springs, White River Park entrance, and Carbon River gateway. With their chestnut back, flanks, and sides they are the most brightly colored of the chickadees of the park. As a rule, however, their partiality to the upper strata of foliage prevent one seeing them at sufficiently close range to appreciate their handsome appearance.

This may be overcome, in a measure, by taking advantage of their curiosity. Establish yourself in an inconspicuous position in the general vicinity of a flock and make a squeaking sound with the lips on the back of the hand. Presently a tiny chestnut back will appear in the needle clumps not far away, calling excitedly and seeking the author of the unusual call note. If you remain quiet and continue the squeaking you may soon find that the trees about you are alive with chestnut backs, buzzing about and hurling imprecations at you as if you were a new kind of owl. Incidentally in the group of excited birds you may catch sight of a number of other species.

Chestnut backed chickadees are sociable bodies, indeed, even gregarious. Seen characteristically in flocks of 4 or 6 to 20 of their own kind, they approve, if they do not actively cultivate, loose association with several others, including western golden crowned kinglets, red breasted nuthatches, Shufeldt juncos, mountain chickadees, and lutescent and Townsend warblers. Of these the kinglets are most often found in their company.

Like most flocking birds, the chestnut backs possess a number of call notes, which doubtless answer the most important requirements of a language. The calls of the chestnut backed chickadees are of smaller volume and higher pitched than those of the mountain chickadee. In fact, some of the notes of the chestnut back closely resemble certain calls of the western golden crowned kinglet, so as to be distinguishable with difficulty. Several much used expressions were caught and set down in our field books as follows: *'wut see see see,'* repeated several times; this was sometimes varied to *'tsweet tsweet tsweet.'* One note is like *whist*, uttered once or repeated as

many as three times. This triple note sometimes sounds like *twit twit twit*. The principal call note heard during one exceedingly foggy, rainy day early in September was *tseet tseet!* or *tseet tseet tsew*, a very kingletlike utterance. This was quite certainly a flock location call, for the birds continued it when we were no longer in view. When scolding us at short range they interjected numerous fine *tseek a dee dees* into their conversation.

As one climbed above the zone of heavy timber the chestnut backs became fewer. But for all that, several companies were seen in the clumps of alpine fir and mountain hemlock in the vicinity of Squaw Lake, near Indian Henrys, the middle of July, while still much snow lay on the ground; and a single bird was observed at timber line (6,500 feet) on the wind-swept ridge between St. Andrews Park and Tahoma Glacier September 13.

The birds are well adapted, apparently, to life in their humid environment. The dripping dampness of the hemlocks and firs on foggy or rainy days seems to bother them little. Full advantage is taken of the matted branches, and they doubtless keep quite comfortable in the shelter of thick clumps of needles.

Chestnut-backed chickadees and gray jays were the only birds observed in Indian Henrys on December 20–21 by Park Superintendent Toll and J. B. Flett.

WESTERN GOLDEN-CROWNED KINGLET

(*Regulus regulus olivaceus*)

Description.—A trifle smaller than a house wren; length about 3¼ to 4½ inches, wing about 2 to 2¼ inches. Adult males with backs olive-green, crown orange, bordered by yellow and black; under parts dingy whitish. Adult females have crown patch wholly yellow. Young lack crown patch and have the head markings obscure.

Identification.—The crown patch, always marked with black and yellow in adults, separates the western golden-crowned kinglet from the ruby-crowned kinglet. Furthermore, the western golden-crown occurs in the park commonly throughout the summer, while the ruby crown is a migrant only.

Occurrence.—A common breeding bird from the park boundaries to timber line. More numerous than elsewhere in the heavy forests of Canadian Zone, below 4,500 or 5,000 feet.

Habits.—It is unfortunate that the foliage-haunting propensity of the western golden-crowned kinglet should keep him out of view so much of the time, because with his regal head dress of orange, yellow, and black, contrasting with the modest green of his back, he is one of the handsomest of small birds.

The western golden-crowned kinglet has much in common with the chestnut-backed chickadee. Both affect the thick foliage of the dark hemlock-fir woods; both are sociable to the point of gregariousness, the kinglet usually being seen in troops of 4 to 12 individuals; their high-pitched sibilant call notes are much alike; they are ordinarily not shy, but, on the other hand, markedly curious, and they are usually found in the same flocks.

The shade and dampness of the dense dripping forests depresses them but little, while the warmth and brightness of a clear forenoon

following a period of storm awakes all their enthusiasm and they are more than usually active.

They lack aggressiveness and, diminutive creatures that they are, seem almost fragile. Doubtless they are protected by their very insignificance. The dash and whirr, the craft and cunning, the strength and independence of some other birds are absent. On soft fluffy wings they flutter delicately beneath a fir-branch tip, uttering their tiny call notes and seeking their diminutive insect prey.

After nesting the kinglets scatter and may be found in unusual places. On August 17 a single bird, the only instance where a solitary individual was observed, was noted in an isolated fir clump on Yakima Park. The record is the more interesting because Yakima Park is arid, open, and well lighted, in marked contrast with the humid, dense, deeply shaded forests in which the golden crown usually occurs.

RUBY-CROWNED KINGLET

(*Corthylio calendula calendula*)

Description.—A trifle smaller than a house wren; length about 3¾ to 4¾ inches, wing about 2¼ inches. Adult male with crown patch bright red; upper parts grayish, brightening to greenish on rump; wings with two white bars; underparts buffy whitish. The female and young are similar but usually lack the red crown patch.

Identification.—The small size, greenish color, and foliage-loving habit distinguish the ruby-crowned kinglet from most other birds; the absence of conspicuous black and yellow markings on crown separate it from the western golden crown. The "ratchet" call note, somewhat like the winding of a watch, is the most convenient field character during migration.

Occurrence.—A migrant only through the park. Found by us in the Hudsonian Zone above 5,000 feet, on the west and south sides of the mountain.

Habits.—The ruby-crowned kinglet has more dash and aggressiveness in his make-up than his relative, the western golden crowned. This is well shown during the spring migration, as the ruby crown traverses a willow clump en route. The appearance of a rival male in his vicinity is the signal for hostilities, *Tid dit; tid dit*, says the defender, and flashing the brilliant red crown feathers, previously concealed, war immediately ensues.

The ruby crown is ever alert for the tiny midge or other toothsome insect. Often he may be seen making a flycatcher-like excursion into the air. His tiny beak snaps and he returns to his perch. Much time is spent foraging among the needles of the fir trees, and frequently a small clump of trees will keep him occupied for a long time. With fluttering wings he poises in air, carefully prospecting the sides and bottoms of the fir branches. While this fluttering mannerism is observable in the western golden crown as well as in the ruby crown, it is more strongly developed in the latter.

Probably no bird of its size occurring in the country has a more beautiful and powerful song than the ruby-crown kinglet. On hearing the song pouring enthusiastically from the top foliage of some conifer, one not familiar with the species looks for a bird of

sparrow size at least; but no. the songster is that tiny bird, so difficult to see among the dense needle clumps. Probably, in view of the fact that the bird does not nest in the park, the song will be heard only infrequently during the migrations.

TOWNSEND SOLITAIRE[28]

(*Myadestes townsendi*)

Description.—Length about 8 to 10 inches, wing about 4¼ to 5 inches. Adults with body plumage gray, paler beneath; wings with two whitish wing bars, bases of primaries and secondaries buffy or yellowish brown; bend of wing and area beneath wing extensively whitish; tail feathers with outer web and terminal portion of inner web grayish white. The young have wings and tail as in the adult; the rest of the plumage is conspicuously spotted with buff.

Identification.—The white wing bars, long tail, grayish body color, slow labored flight (with extensive white areas on wings and tail becoming clearly visible), and the rather mournful whistled *whoop* or *wheep*, are among the most useful field characters of this bird.

Occurrence.—In Hudsonian Zone between 4,900 and 6,500 feet, all around the mountain.

Habits.—The solitaire seems to possess some of the characteristics of the mocking birds, others of the flycatchers, and still others of the robin family, to which latter, of course, the bird belongs. In the park it is most commonly found in the forests of dead stubs or ghost trees.

On July 12 a solitaire was observed feeding on the snow in the vicinity of Mount Ararat, near Indian Henrys. On September 8, 25 to 50 of the birds were seen at Sunset Park, flying about and perching in dead stubs near camp. Doubtless they were taking part in a general migratory movement. A half dozen birds were seen September 13 in the conifers at timber line in St. Andrews Park, hawking for insects. If one is privileged to travel through the high country at a sufficiently early date he should hear the solitaire's exquisite song; but we were evidently too late for this, not reaching its habitat until July 7.

RUSSET-BACKED THRUSH

(*Hylocichla ustulata ustulata*)

Description.—Length about 7 to 7½ inches, wing about 3½ to 4 inches. Upper parts olive brown, wings and tail somewhat browner; a buffy eye ring present; chest pale buff, whitish in summer, marked with narrow triangular spots; underparts white, sides tinged with olive brown.

Identification.—The size, whitish underparts spotted with darker, and retiring habits distinguish the thrushes from other birds. The russet-backed thrush has more brownish color on upper parts and breast than the hermit thrush and is a trifle larger. The rufous of the tail is less intense also.

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[28] See note, p. 28.

FIG. 106.—Russet-backed thrush at nest, Portland, Oreg. (Photograph from life by William L. Finley and H. T. Bohlman)

Occurrence.—Doubtless a breeding bird in the Transition and Canadian Zones all around the mountain, usually below 3,500 feet. Not common. Occasionally wanders upward into the Hudsonian Zone, particularly after the nesting period.

Habits.—As we climbed the Rampart Ridge near Longmire late one summer afternoon an attractive picture was presented. The sun sank behind the hills and the greens of the forest grew darker in the Nisqually Valley below and on the opposing slopes of Eagle Peak. A soft breeze rustled through the conifers. The evening songs of several thrushes, soothing and harmonious, floated up to us from the forest, seeming to make vocal the spirit of the summer twilight.

The song is the more attractive because of the retiring nature of the bird, for the russet-backed thrush is unusually shy, spending most of its life in deep shady woods and in damp situations bordering swamps or fern-bordered streams. If its territory is invaded it slips quietly away, perhaps watching the intruder from a branch near the ground at a safe distance. An unusual squeaking sound will sometimes decoy the bird into one's immediate vicinity.

Cantwell found a nest with three eggs at Ohanapecosh Hot Springs on August 3. It was built in a vine maple, 5 feet above the ground, in a clear space on the hillside in the gloom of a dense fir forest. The nest was made of roots, grass, and plant stems. Many bleached forest leaves had been added to the outside, so that the nest was inconspicuous, an effect which was heightened by the very openness of the situation. After being frightened from the nest the parent bird was seen only once near the nest, thus showing but little solicitude for its safety.

SIERRA HERMIT THRUSH

(*Hylocichla guttata sequoiensis*)

Description.—Length about 6 to 7 inches, wing about 3½ to 3¾ inches. Upper parts grayish brown, tail deep rufous; underparts buffy or whitish, breast marked with prominent wedge-shaped spots.

Identification.—In the field this bird is often difficult to distinguish from the russet-backed thrush. The upper parts are less intense brown than in that bird, and the deep rufous of the tail contrasts more strongly with the color of the rest of the upper parts.

Occurrence.—From park boundaries to timber line.

Habits.—Being far more abundant and widespread in the park, as well as less secretive than the russet-backed thrush, the hermit is the thrush most likely to be seen by the park visitor. The bird was equally at home in the dwarfed trees at timber line and the magnificent woods at lower levels.

A nest was found by Mr. and Mrs. William L. Finley near the Third Crossing Bridge on the Washington Cascades, Paradise River. As Finley writes:

> One of the impressions a person gets in the higher mountains is a lack of bird life. Yet if he keeps his eyes and ears open he is likely to discover birds that are shy and not seen by the ordinary observer. Of the hundreds or thousands of people passing over this Third Crossing Bridge perhaps not a single one during the summer season discovered the nest of a hermit thrush in the branches of a scrub fir that hung down from the top of a rock wall

a few feet above the rushing waters and not more than 20 feet from the railing of the bridge. Standing on the bridge, we could watch the male and female feeding the young birds.

By climbing the rock 6 or 8 feet I could get a foothold on a flat stone, but could not stand up on account of the overhanging rocks. Both the parent thrushes were feeding young birds that were about a week old. They were shy at first, and we had to sit crouched down for quite a while to get the birds used to our being so near the nest. They perched in the branches above and did not dare to go to the nest. After staying around the vicinity for three days and making frequent visits, we were on intimate terms with both birds. We found the shyness in the thrushes was an indication of their finer nature. We enjoyed visiting them and trying to get some good pictures. (Mazama, vol. 5, 1919, pp. 323–324.)

On August 4 a hermit thrush was seen on the ground on a ridge near timber line in Ohanapecosh Park, and a little later an adult

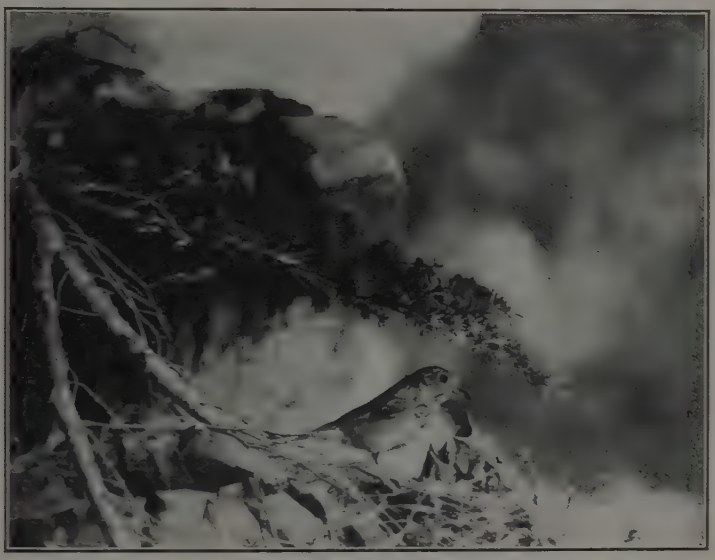

Fig. 107.—Sierra Hermit thrush feeding young, Paradise River. (Photograph from life by William L. and Irene Finley)

and three young were seen in whitebark pines in a similar situation, altitude 6,000 feet. The call note of the young was a plaintive *teeup! teeup! teeup!* An excedingly thick fog hung like a pall over the landscape, but the hermit thrush seemed to enjoy fog, clouds, and rain. Often on dark days, or in the denser woods, an individual thrush suddenly appeared on a log or stone in the open, and flirting its wings in typical thrush fashion, inspected the passer-by. Curiosity is a marked trait. Once while we visited our traps a thrush appeared within 15 feet. At short intervals it gave a whistled *tchit* or *whooit* call. Frequently, but not always, one, two, or three wing flirts were given at the same time as the call. The bird seemed torn between conflicting emotions, once or twice making as if to leave, but each time curiosity got the better of it and it remained. It cocked first one eye at the intruder, then the other.

Once it scratched the corner of its mouth. It remained on the lower branches of a western hemlock usually 12 to 15 feet above the ground.

WESTERN ROBIN

(*Turdus migratorius propinquus*)

Description.—Length 9 to 10 inches, wing about 5 to 5½ inches. Adults have head, wings, and tail blackish; rest of upper parts slate-gray, the black of the hind neck sharply contrasting with the gray of the anterior part of the back; throat white, streaked with black, under-tail coverts and posterior part of belly whitish; rest of under parts rufous. The female is paler and duller than the male. The young have the underparts spotted, upper parts streaked with white.

FIG. 108.—Western robin, Jennings Lodge, Oreg. (Photograph from life by William L. and Irene Finley)

Identification.—Adults may be easily told by their size and the conspicuous black head, wings, and tail, contrasted with the rufous underparts. Young birds might be confused with young of the varied thrush, but lack the two brown wing bands of the latter.

Occurrence.—A breeding bird from the park boundaries at least to 6,000 feet.

Habits.—The western robin, with his handsome color, dignified mien, beautiful song, characteristic mud-plastered nest, and attractive blue eggs, is one of the best-known birds of the park. What a charming bird he is! Interesting for a hundred mannerisms of song, action, and habits, he well repays more than casual attention.

The camper knows that the robin is one of the first birds to sing in the morning and one of the last to settle down for the night. One of the most attractive features of the mountain meadows at twilight is the robin's loquacious preparation to retire. From every willow

chump, quite likely, will come a chorus of *keep keeps*, as if the birds were talking it all over before going to sleep.

One is likely to find robins on open grass-covered areas, whether clearings in the thick timber, extensive alpine parks, or high ridges nearly at timber line. The robin's preference, however, seems to be for burns, where berry vines, decaying logs full of insects, and a wealth of other food-furnishing material are generously abundant. One robin seen August 29 in Glacier Basin was molting badly. It had lost all its tail feathers, and presented a comical appearance. In the fall the birds gather in flocks in favorable burns, where they feed on huckleberries and mountain ash. Life at this season becomes for them a continuous feast, until the early snows give warning of the approach of winter. A company of 12 robins, the first of the season, was observed at Longmire, March 21, 1920, by J. B. Flett.

VARIED THRUSH; ALASKA ROBIN; OREGON ROBIN; PAINTED ROBIN; WINTER ROBIN

Ixoreus naevius naevius

Description.—Size about that of a western robin. Upper parts of adult male dark bluish slate, wings with two brown bands, as well as brown edgings; sides of face black, with a brown line above the eye and running back therefrom. Underparts bright rusty brown, with conspicuous black breastband; belly with mixed white and gray. The adult female is duller, the upper parts are washed with brown, which is deeper in winter, and the black breastband is obscured by brown feathers. The young are like the adult female, but duller.

Identification.—The conspicuous markings of this bird prevent one's confusing it with any other except, perhaps, the robin. From the latter, the brown markings on the side of the head, the black breastband, and the brown wing bars serve to distinguish adults. The brown wing bars and edgings may apparently be relied on to separate the two in any stage of plumage.

Occurrence.—From park boundaries to timber line, all around the mountain.

Habits.—This bird, while abundant in the park, is never conspicuous. As it hops along on trail or log, silent in the shadow of the deep forest, the varied thrush is one of the most graceful birds of the woods. When startled it remains motionless, and this "freezing" is assuredly an effective protection. In the two-thirds light of its habitat it all but disappears, becoming a part of the dark log on which it was so plainly seen only a moment before. If it happens to be back toward one it is still harder to see, and one often wonders whether, after all, that dark projection is the bird or only a snag.

The song of the varied thrush is one of the most elusive of bird sounds. Downpours of rain are frequent in the varied thrush's woods. Following the drenching the sun appears and the droplets of water on the conifer needles become a million glistening jewels. The chipmunks, Douglas squirrels, kinglets, chickadees, and wrens break forth into extraordinary activity in the grateful interim between showers. At intervals is heard the trill of the varied thrush, "the famous note that holds the rapt sublimation of the songs of all the thrushes." Take this trill from the magnificent northwest forest

and you would rob them of a real attraction. For the song, perhaps more surely than anything else, recalls shadowy forest aisles, with shafts of sunlight penetrating through the branches of giant hemlocks and firs to the damp mossy ground, and, as the varied thrush is heard now near, now far, there is suggested the mystery of untrod forest depths beyond.

A nest found by Stanley G. Jewett at Reflection Lakes on July 19 contained three young estimated to be 5 days old, as well as one addled egg. The young were covered with grayish down. Companies of parents and young were observed during July and the first half of August. The parents at this time were fairly conspicuous, for they often became alarmed for the safety of the young, and endeavored to distract attention so the young might escape.

Although usually observed only in the thick timber, on rare occasions the curiosity or exuberance of spirits of the bird resulted in its appearing on a stub in the open. One bird was observed at Sunset Park perching 50 or 60 feet up on a tall dead stump in an open burn near camp.

Late in September, during a snowstorm, the varied thrush was abundant on the ground in the shelter of the mountain ash brush along a little creek in Paradise Park. One might think that the birds would have preferred the cosy shelter of the thick foliage of mountain hemlock or alpine fir, but perhaps the creek border furnished both food and shelter.

J. B. Flett says the bird remains in the vicinity of Longmire all winter, becoming very active in March, as the spring season approaches.

WESTERN BLUEBIRD

(*Sialia mexicana occidentalis*)

Description.—Length about 6½ to 7 inches, wing about 4 inches. Adult male with upper parts dark purplish blue and chestnut; throat purplish blue; breast dark rufous; rest of underparts brown, dull bluish, and grayish. Adult female with head, neck, and upper parts gray, usually washed with brownish on back; rump and tail bright blue. Underparts grayish with buffy brownish on breast. The young have the upper parts dark gray streaked with white, the underparts gray, spotted with white.

Identification.—Adults can be distinguished from adult mountain bluebirds by their possession of brown coloration beneath; the young by the deeper brown streaks beneath and the darker grayish brown of the upper parts.

Occurrence.—Rarely in the Canadian Zone below 4,500 feet.

Habits.—While occurring irregularly in eastern Washington, the western part of the State is the center of abundance of the western bluebird. Like others of their kind, this bluebird is noteworthy for its gentle and sociable disposition. If a suitable box is provided the bird is quite likely to utilize it for a nest site. The natural home of the bluebird is, of course, the abandoned nest of a woodpecker or other similar cavity, which the nest box should be made to simulate as closely as possible.

The bluebird's food during the nesting period is principally insects. Wild fruit is eaten at other seasons. It is fond of mistletoe

FIG. 109.—Western bluebird at nest hole, Jennings Lodge, Oreg. (Photograph from life by William L. and Irene Finley)

berries, and it is an important agent of dispersal of this parasitic plant.

The western bluebird was only twice seen in the park—at Longmire, July 6, and in a burn at 4,000 feet altitude between Nisqually Glacier and Narada Falls on August 2. The species was common in the vicinity of Ashford, 5 miles west of the park; at Vance, 15 miles south; and one was seen at Bear Prairie, 3 miles south of Longmire, on September 2.

MOUNTAIN BLUEBIRD

(*Sialia currucoides*)

Description.—Length about 6½ to 8 inches, wing about 4¼ to 4¾ inches. Adult male with upper parts light purplish blue or greenish blue; underparts pale greenish blue. Adult female with upper parts brownish gray, wings and tail bright blue, underparts buff-grayish, with blue bases of feathers showing through. The young are brownish or grayish, streaked with white; wings and tail blue.

Identification.—The bluebirds are not likely to be confused with any others. The adult mountain bluebird can readily be distinguished from the western bluebird by the absence in the former of brown color beneath. The young have the brown streaks on the underparts much less intense than in the western bluebird, and the color above paler.

Occurrence.—In upper Canadian and Hudsonian Zones to timber line, or between altitudes of 4,000 and 6,500 feet, all around the mountain; more common on east side.

Habits.—Bluest of all the bluebirds, handsomest of its kind, the mountain bluebird is far more abundant on Mount Rainier than the western bluebird.

In eastern Washington, as in the northeastern States, the bluebird is the harbinger of spring. Its brilliant color compensates for its deficient vocal powers.

On July 18 at Reflection Lakes a nest with young was discovered 30 feet up in a dead stub. Both parents were feeding the young. Observations were tabulated as follows: The female fed at 9.56 a. m.; then at 9.57½ and 9.59. The male fed at 10.02; then the female fed at 10.03, 10.05, 10.06, 10.09, and 10.10. The male fed once at 10.11 and the female again at 10.15, 10.22, 10.26, and 10.30. These observations were summarized as follows: The young were fed 14 times in 34 minutes, the feedings averaging 2.4 minutes apart. The male fed twice in this time, the female 12 times. The rate of feeding established by this set of observations is approximately 22 times an hour. If this is maintained for five hours in the morning and another five hours in the afternoon, 220 feedings a day would be indicated. But on Mount Rainier at this time of year there were nearly 17 hours of daylight. If the birds averaged 22 feedings an hour for 17 hours, a total of 374 would be indicated. This figure may be closer to the truth than the former one. The male was a shy bird and usually paused on a short branch one to three or four minutes, afraid to go to the nest while the observer was about. The mother was far

less cautious. She usually perched for a moment on a branch near the nest and then went directly to it, often entering the cavity and apparently covering the young for a moment. On arrival at the nest tree the birds uttered a *chuck, chuck*, or *chuck chuck chuck;* on leaving a *tsew* or *tseewoow* was given. The female was closely watched to see where she found her insect prey. First she would fly to the top of a stump, then to the tip of a small conifer, both of which evidently served as observation stations. She then dropped to the ground, where her movements could not be followed. The forage range of the parents appeared to be a circle up and down hill about 200 yards in diameter.

The arid Yakima Park country northeast of the mountain was a favorite locality for the bluebird. Here it was found in groups of four or five on the ground or perching on the isolated clumps of alpine fir. Characteristic of the bird is its habit of hovering a few feet above the ground in search for insects. Its sight must be exceedingly keen, for often it poises at a considerable distance above the ground, suddenly dropping and capturing its prey.

About noon on September 15 a pair of mountain bluebirds were seen at 7,000 feet altitude, near Tokaloo Rock, above the scenic St. Andrews Park on the west side of the mountain.

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